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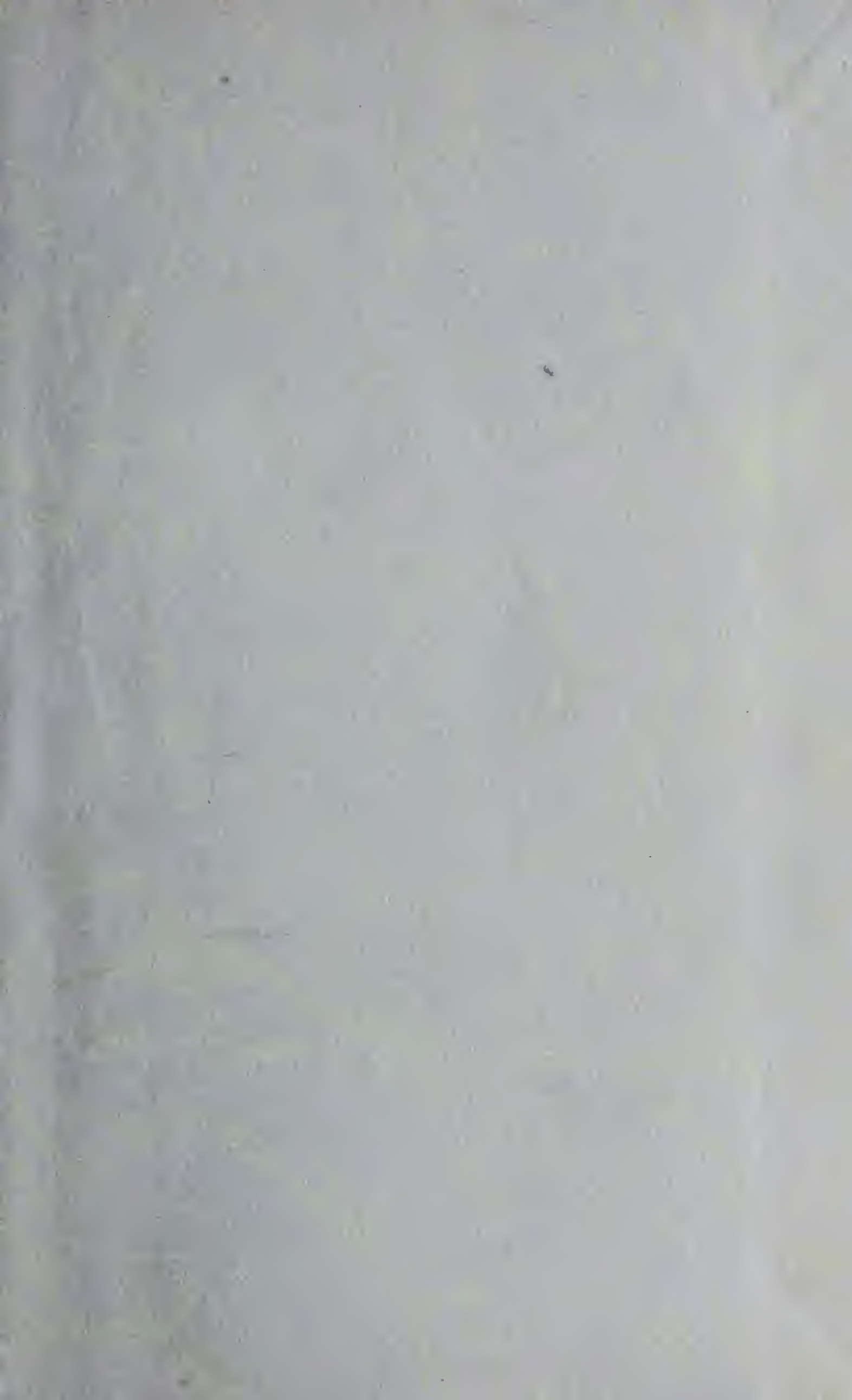
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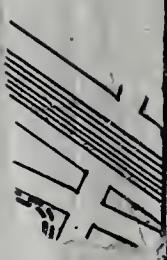


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ROYAL COMMISSION FOR THE
CHICAGO EXHIBITION, 1893.

OFFICIAL CATALOGUE

OF THE

BRITISH SECTION.

FIRST EDITION.

LONDON:

WILLIAM CLOWES & SONS, LIMITED,
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1893.

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INTRODUCTION.



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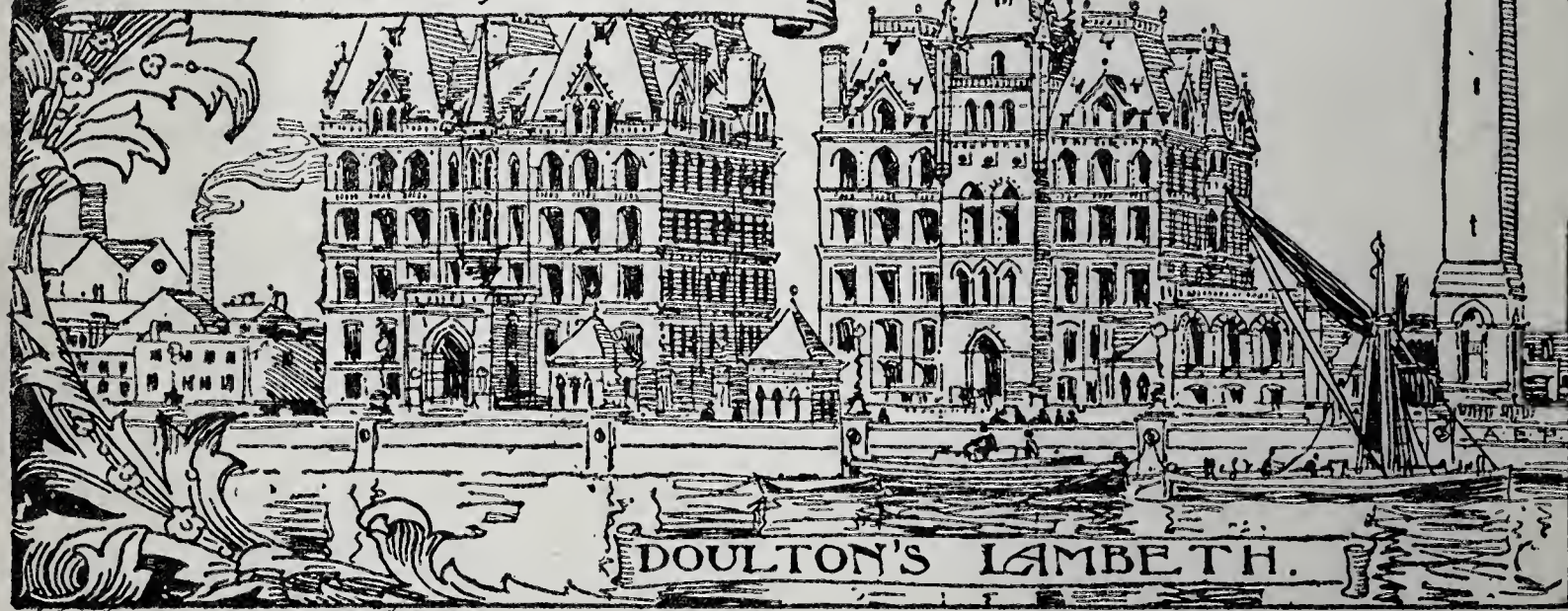
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Introduction.

IN March, 1891, Mr. Robert Lincoln, the American Minister to Great Britain, made on behalf of his Government a formal application to the Prime Minister, Lord Salisbury, asking that this country should take part in the proposed Exhibition at Chicago, and received the reply that a Royal Commission would be appointed for the purpose.

In the following June Sir James Fergusson, the Under-Secretary of State for Foreign Affairs, applied to Sir Richard Webster, who then held the office of Attorney-General, and was the Chairman of the Council of the Society, to know whether the Society of Arts would undertake the organisation of the British Section of the Chicago Exhibition if a grant of £25,000 were appropriated by the Treasury for the purpose.

The Council of the Society, after careful consideration, agreed to undertake the duty on the understanding that a charge, proportional to the space occupied, should be made to the Exhibitors, in order to supplement the amount of the Government grant. This had been done in Paris in 1889, when the British Section was successfully managed under the authority of a private committee, nearly all the funds required having been obtained in this manner.

On the 9th July, Sir James Fergusson addressed a letter to Sir Richard Webster stating that the Lords of the Treasury would accept the offer of the Society to undertake the organisation of the British Section in Chicago in 1893, and that they had requested the Home Office to take the necessary steps for constituting the Council of the Society for the time being* a Royal Commission for this purpose. On the 26th August, 1891, the Commission was actually issued.

* A List of the Commission as at present constituted will be found on pp. xv and xvi.

The Society of Arts* has always been closely associated with exhibitions both in England and abroad. Founded in 1754 for "the encouragement of the Arts, Manufactures and Commerce of the country," it promoted in 1760 the first English exhibition of pictures; and held in 1761 what appears to have been the first exhibition of an industrial nature held in any country, when it showed in public the machines for which its premiums had been awarded. From this grew a long series of industrial exhibitions held by the Society in the house which the Adamsons built for it in the Adelphi, and from these again originated the Exhibition of 1851, and its successor of 1862.

That the 1851 Exhibition was more than a mere expansion of the Society's annual exhibitions was due to the foresight of H.R.H. the Prince Consort, who was its president from 1843 to 1862, and his lamented death in that year certainly diminished both the prestige and the success of the 1862 Exhibition. Prince Albert was succeeded in the presidency, after a year's interval, by his son, H.R.H. the Prince of Wales, who still occupies the post. The importance attached by the Prince to International exhibitions, and his interest in them, was shown by the active share he took in the two great Exhibitions of Vienna (1873) and Paris (1878), for on both occasions he was the working President of the British Commission.

The first step taken by the Council of the Society of Arts was actually in anticipation of their formal appointment, for before their Commission was gazetted they communicated with the India Office and the Colonial Office, and requested that steps might be taken to

* The objects of the Society are thus stated in the Charter by which it was incorporated by Royal Charter in 1847, after nearly a hundred years of independent existence: "The encouragement of the Arts, Manufactures and Commerce of the country, by bestowing rewards for such productions, inventions or improvements as tend to the employment of the poor, to the increase of trade, and to the riches and honour of the kingdom; and for meritorious works in the various departments of the Fine Arts; for Discoveries, Inventions, and Improvements in Agriculture, Chemistry, Mechanics, Manufactures, and other useful Arts; for the application of such natural and artificial products, whether of Home, Colonial, or Foreign growth and manufacture, as may appear likely to afford fresh objects of industry, and to increase the trade of the realm by extending the sphere of British commerce; and generally to assist in the advancement, development, and practical application of every department of science in connection with the Arts, Manufactures, and Commerce of this country."

form the British Colonies and the Indian Government of the action which Her Majesty's Government proposed to take with regard to the Chicago Exhibition.

Their reason for this prompt action was their desire that the Colonies and India might have the earliest possible notice of the appointment of a British Commission, and the longest possible time for the preparation of their exhibits.

The Dominion of Canada decided without delay to take part in the Exhibition, and appointed as their Executive Commissioner Mr. William Saunders.* It was for some time uncertain which of the Australian Colonies would be represented. Victoria, Queensland and Tasmania, all had under consideration the appointment of commissions; but eventually New South Wales alone decided to contribute. A Commission for the purpose was appointed, of which Mr. William McMillan is the President, and Dr. Renwick is the Executive Commissioner.

The Cape nominated as their Commissioner Mr. Ludwig Piener, and Ceylon appointed the Hon. J. J. Grinlinton to a similar office. The other British Colonies taking part in the Exhibition are the British Guiana (B. Howell Jones, Commissioner); Jamaica (Colonel Charles J. Ward, Commissioner); and Trinidad (J. Russell Murray, Secretary of Commission). Several other Colonies intimated their intention of participating, but afterwards withdrew.

The total space occupied by the British Colonies amounts to about 188,000 square feet, divided approximately as follows †:—

Canada	..	..	..	..	..	100,600
New South Wales	..	..	..	..	..	50,000
Cape Colony	..	..	..	..	..	4,000
Ceylon	..	..	..	..	..	22,000
British Guiana	..	..	..	..	..	500
Jamaica	..	..	..	..	..	5,000
Trinidad	..	..	..	..	..	500

* Mr. Saunders was compelled to retire by ill-health in November, 1892, and his place was taken by Mr. J. S. Larke.

† These figures require correction. An amended statement will be given in a later edition.

The Government of India did not at first propose to take any part in the Exhibition, but eventually they made a grant of 40,000 rupees to the Indian Tea Association, to assist them in exhibiting Indian Tea, and a grant of 10,000 rupees to Messrs Tellery, of Delhi, to aid in the formation of a representative collection of Indian Art Ware. They have also undertaken to prepare and send a small collection of Indian Forest Products. There are also several independent Indian Exhibitors.

The total area occupied by India will be a little less than 5000 square feet.

As soon as the necessary information had been obtained from the American Executive, the proper steps were taken by the Commission to bring the Exhibition prominently under the notice of British manufacturers. Circulars were sent to those who had taken part in former Exhibitions, and to a selected list of other firms including all important manufacturers who were ascertained to have large dealings with the United States, and advertisements were inserted in the principal English, Scotch and Irish newspapers.

By these means considerable interest was aroused in the Exhibition, and the result was that when the vote on account of the grant came before the House of Commons in Committee of Supply, great exception was taken to the smallness of the amount proposed, and there was a strong expression of opinion from all sides of the House that the amount should be largely increased. The Commission felt themselves justified by this expression of feeling in urging upon the Chancellor of the Exchequer the desirability of placing a larger sum at their disposal, especially in view of the fact that the contributions of all the other great countries which proposed to take part in the Exhibition were on a much more liberal scale. As a result of this application, which was strenuously supported by the Chairman of the Commission, the Chancellor of the Exchequer, on the 14th April, 1892, intimated that Her Majesty's Government were willing to increase the grant to the Royal Commission from £25,000 to £60,000, on the understanding that space should be provided free to British exhibitors.

This fresh arrangement necessitated considerable alteration of the original plans. The deposits, amounting to £4,524, which had been paid by intending exhibitors on account of the space they

sired to occupy, were returned, and fresh announcements issued, giving the altered conditions.

The number of applications for space was largely increased, and before long all the space available for the British section was occupied. It was not found possible to accommodate all the applicants, or to grant in every case the amount of space asked for; but a careful selection was made, and much trouble was taken to, as far as possible, satisfy the legitimate demands of all intending exhibitors.

The total area allotted to Great Britain and the British Possessions within the Exhibition buildings is about 500,000 square feet, of which over 300,000 is occupied by Great Britain.* The manner in which this space is distributed through the various buildings of the Exhibition is shown in the following Table :—

AGRICULTURE	14,176 square feet.
HORTICULTURE	656 „ „
FISHERIES	1,300 „ „
MINES AND MINING	8,000 „ „
MACHINERY	40,000 „ „
TRANSPORTATION	54,257 „ „
(Including Annexe and Gallery.)	
MANUFACTURES	100,400 „ „
LIBERAL ARTS	64,240 „ „
(Gallery of Manufactures Building.)	
ELECTRICITY	8,289 „ „
(Including Gallery.)	
WOMAN'S BUILDING	2,384 „ „
FORESTRY	1,700 „ „
FINE ART	20,325 „ „
Total	<u>315,727</u>

Besides this amount, spaces have been assigned in the grounds of Jackson Park for the offices of the Commission, and for certain special exhibits.

* The amount of space occupied by Great Britain and the Colonies (including India) at Paris in 1867 was 383,373 square feet, the expenditure was £126,000. At Vienna, 1873, the space was 169,827 square feet, the cost £28,753. At Philadelphia, 1876, the space was 194,381 square feet, the cost £39,981. At Paris, 1878, the space was 363,018 square feet, the cost £66,983. At Paris, 1889, the space was 232,845 square feet, the cost £29,422.

The Victoria House, as Her Majesty has graciously permitted the Commission offices to be entitled, may be considered as the contribution of the British Commission to the decoration of Jackson Park.

The building is from the design of Colonel Edis, the Honorary Architect of the Commission, and is intended to be generally characteristic of the best type of English half-timber houses of the 16th century, of which there are so many good examples still extant. It is, however, a modern house, and for this reason it has been considered permissible to employ terra-cotta somewhat largely in the lower storey, with red brick facing and mullioned windows. The upper portion is of half-timber construction, with overhanging and projecting gables. The plan forms three sides of a quadrangle, with the open side next the lake, enclosed by a raised terrace with balustrade. The centre, on the front or inland side, is recessed, with steps leading from both sides up the covered portico, which opens into a large central hall; off this are, on one side, large library and reception rooms, while the other wing is occupied by the offices. On the first floor is a large suite of rooms and offices. Great care has been bestowed on the interior decorations. All the principal rooms are fitted with wall panelling and elaborate ceilings, after the manner of some of the best English country houses. The Commission are much indebted to Messrs. Johnstone, Norman & Co., of New Bond Street, who have provided, as an exhibit, the whole of the internal fittings and furniture.

One of the earliest steps taken by the Commission appointed was the formation of a number of Committees to assist them in the various departments of their work. A list of these will be found on pages xvii to xxv.

The selection of the pictures to represent the British school, and the arrangements for their transport to Chicago and exhibition there, were left entirely in the hands of the Fine Arts Committee, of which Sir Frederick Leighton is the President and Mr. J. W. Beck the Secretary. A selected list of artists was formed, and to all of those on the list an invitation was addressed, asking them whether they wished to contribute to this section, and if so to give the titles of the pictures by which they desired to be represented.

To this invitation a very satisfactory response was received, and steps were then taken to obtain the loan of the pictures designated from their owners. A date was also fixed for the reception of pictures from other than the invited artists, in order that they might be submitted to the judgment of the Committee. The governing body of the Imperial Institute kindly provided accommodation in their new building at South Kensington for the reception and packing of the pictures.

The Women's Committee, under the Presidency of H.R.H. Princess Christian, have in the same way had full control of all the arrangements of the Women's Section, a grant for the purpose of defraying the expenses having been placed at their disposal by the Commission. The work in this section has been mainly done by means of Sub-Committees, whose action was supervised by the General Committee. Miss Lankester, of the National Health Society, is the Secretary of the Committee.

The Agricultural Committee was presided over in the first instance by the Earl of Feversham, the President of the Royal Agricultural Society, and afterwards by the Duke of Westminster, Lord Feversham's successor in the same office. Mr. Ernest Clarke, the Secretary of the Society, is the Honorary Secretary of the Committee, which has had many meetings at the rooms of the Society in Hanover Square, London. The programme of the Live Stock Exhibition was carefully considered by a Sub-Committee of this Committee, and a number of suggestions, which the Committee thought would facilitate the sending to Chicago of British live stock, were made to the Executive at Chicago. Some of these suggestions were acted upon, but others do not seem to have commended themselves to the Department of Agriculture. The difficulties attending upon sending live stock to such a distance, and especially the necessity for keeping them in quarantine for a period of ninety days, have prevented many applications being received from exhibitors in this class.

A special Committee, with Mr. Francis Cobb as its chairman, and Mr. F. Seyton Scott as its secretary, was appointed to organize a loan collection of photographs, illustrative of the present condition of the art in this country. In order to insure a thoroughly repre-

sentative collection, an invitation was addressed to a selected list of the principal photographic artists in Great Britain, and in nearly every case an affirmative reply was received. A list of the works contributed will be found on page 377.

All the Chambers of Commerce in the Kingdom were invited to act as Local Committees, and many of them consented to do so. Through their agency information about the Exhibition was distributed through the country, and a local centre provided in many of the principal manufacturing districts. A list of these Local Committees is given on page xxv.

For Ireland a special Local Committee was appointed. It consisted of representatives of the Corporation of Dublin, of the Dublin Chamber of Commerce, and of the Royal Dublin Society. Its headquarters are in Dublin.

In addition to the contributions from exhibitors in the various departments of the Exhibition, the Commission have received a number of loan exhibits. Putting aside the Fine Art Department, the pictures in which are really loan exhibits, these include the Photographic collection above mentioned; an exhibit of Educational Apparatus and specimens, formed by the School Board for London; a similar exhibit by the Science and Art Department; and collections formed by the Ordnance and Geological Surveys. Particulars of all these and others will be found in the Catalogue.

There is also exhibited in the Mines Department a collection of Economic Minerals, specially formed on behalf of the Commission by Mr. Bennett H. Brough (*see* page 121), and a collection illustrating British Metallurgy, formed by Dr. E. J. Ball (*see* page 130).

There are also many objects lent by exhibitors for the use of the Commission, of which a list will be found on page xxxiii.

The banners lent by seventy-six Corporations of the United Kingdom form an interesting addition to the decorations of the British Section in the Manufactures Building. These banners, each of which bears the historic arms of one of the ancient municipalities, have been lent by the Corporations of the cities and towns enumerated on page xxxviii. Many of them have been specially prepared for the occasion.

Several of the ancient City Companies of London have also provided banners for the same purpose (*see* page xxxix).

In January, 1892, the Commission published a Handbook of Regulations and general information relating to the Exhibition generally, and the British Section in particular. Of this, successive editions were issued in April, June, August, 1892, and in January, 1893, increasing in size from sixty-four pages to two hundred. The last Edition contained a list of the Royal Commission, and the Committees appointed by them; a synopsis of the classification; the regulations issued by the Chicago Executive, the United States Customs, and the British Commission; information as to cost, &c., of freight; an abstract of the United States Tariff; information as to routes to Chicago; brief descriptions of the Exhibition and the various buildings; and much other general information, such as seemed likely to be useful to Exhibitors and to visitors.

With the view of adding to the interest and to the permanent value of the Catalogue, the Commission arranged that each Section should be prefaced by a short introduction, and they were fortunate enough to secure the assistance of the following eminent authorities in the preparation of these introductions:—

Agriculture, Ernest Clarke, Secretary of the Royal Agricultural Society; Food, &c., R. Bannister, F.C.S.; Horticulture, W. Thiselton Dyer, C.M.G., F.R.S., Director of the Royal Gardens, Kew; Live stock, Ernest Clarke; Sea Fisheries, Prof. E. Ray Lankester, F.R.S.; Angling, R. B. Marston, Editor of the *Fishing Gazette*; Mining, Prof. C. de Neve Foster, D.Sc., F.R.S., H.M. Inspector of Mines; Metallurgy, Prof. W. C. Roberts-Austen, C.B., F.R.S., Chemist to the Mint; Machinery, H. Graham Harris, M.Inst.C.E.; Ships, Prof. Francis Elgar; Railways, Sir Douglas Galton, K.C.B., F.R.S.; Common Road Carriages, George N. Hooper; Bicycles and Tricycles, George Lacy Hillier; General Manufactures, Reginald H. Hooker, Assistant Secretary of the Statistical Society; Textiles, Swire Smith; Pottery, Wilton P. Rix; Electricity, Prof. W. E. Ayrton, F.R.S.; Fine Arts, J. E. Hodgson, R.A., Professor of Painting to the Royal Academy of Arts; Education, J. G. Fitch, M.A., H.M. Chief Inspector of Schools; Music, J. A. Fuller Maitland; Photography, Capt. W. de W. Abney, C.B., F.R.S., Assistant Director of the

Science and Art Department ; Scientific Apparatus, Prof. Silvanus Thompson, D.Sc., F.R.S. ; India, Samuel Digby, Secretary of the Indian Section of the Society of Arts ; Women's Work, Mrs. Fawcett

It is believed that these introductions will be appreciated by those who have to consult the Catalogue, and that the information contained in them will be generally serviceable. Limits of space have in all cases precluded any attempt at an exhaustive treatment of the several subjects, but it is hoped that each introduction may serve to provide at least a summarised account of the present condition in Great Britain of the Industry, Art, or Science with which it deals.

H. T. W.

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The names of Members of the Royal Commission are underlined.

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Synopsis of the Classification.

DEPARTMENT A.—Agriculture, Food and its Accessories, Forestry and Forest Products—Machinery and Appliances.

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British Section



Chicago Exhibition.

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Towelling for use at Victoria House.

Brown & Sons, John S., *Belfast.*

Table linen for use at Victoria House.

Chubb & Sons, Lock and Safe Co., Limited, 128 *Queen Victoria Street, London, E.C.*

Safes in Victoria House.

Daniell & Sons, A. B., 42-46 *Wigmore Street, London, W.*

China and glass for use in Victoria House.

Doulton & Co., *Lambeth, London, S.E.*

Large group of America executed in terra-cotta in the grounds, the Doulton-ware fountain in the garden, and the two terra-cotta panels by George Tinworth, viz., "The Prodigal Son" and "Pharaoh at the Red Sea," in the vestibule, of Victoria House.

Galloways, Limited, *Knott Mill Iron Works, Manchester.*

The horizontal compound engine driving one of the three lines of shafting running through the British section of the Machinery Building. It is suitable for indicating 350 horse-power at 70 revolutions per minute, with 100 lbs. boiler pressure, and has low-pressure cylinder, 30 inches bore, placed over the high-pressure cylinder, 17 inches bore, both having a stroke of 3' 9". The piston rods of these two cylinders drive on to one crank pin by means of connecting rods, the slide block for the low-pressure cylinder working on slide recessed in the bed-plate, and that for

high-pressure cylinder on steel slide bar forming a stay between the cylinder and the framing. The engine is fitted with Galloways' latest gear, the distribution of steam being effected by short slide valves. The high-pressure cylinder is provided with multi-ported or gridiron expansion valve working on the back of the main slide. The main slide is operated by eccentric from the crank shaft, and the expansion valve by curved slotted link, with an improved motion patented in 1890, allowing the admission of steam at full pressure without the intervention of a throttle-valve, and giving a quick cut-off from any point from 0 to 66 per cent. of the stroke of the piston. The governor is driven by gearing, and is of the improved parabolic type, giving great sensibility and steadiness of turning; it is connected directly to the rod of the expansion slide valve, which it controls, giving admission of steam according to the load upon the engine. The crank necks are 12 inches diameter, and the shaft carries a fly-wheel 23 feet in diameter, grooved for twelve $1\frac{3}{4}$ inch ropes, which it is hoped to utilize for transmitting the power, though it is possible that a separate driving pulley may require to be placed outside the outside pedestal. The condenser is placed in rear of the engine, the air pump being horizontal, worked direct by continuation of the low-pressure piston rod.

Goldsmiths & Silversmiths Co., 112 *Regent Street, London, W.*

Electro plate for use in Victoria House.

Homacoustic Speaking Tube Co. (The), 17 and 18 *Telegraph Street, London, E.C.*

Speaking tubes in Victoria House.

Johnstone, Norman & Co., 67 *New Bond Street, London, W.*

DECORATION AND FURNITURE, ETC., EXECUTED FOR THE VICTORIA HOUSE.

The Grand Hall and Staircase.—The modelled plaster ceiling of the hall is copied from one in "Plas Mawr," Conway, North Wales, built about 1550, and generally known as "Queen Elizabeth's Palace"; that over grand staircase and principal landing is taken from one at Haddon Hall. The remainder of the enriched plaster work has been designed by Col. R. W. Edis, F.S.A., from whose drawings the oak panelling, chimney-pieces, and staircase

have also been executed. The furniture of carved oak is somewhat in the Italian style of the Renaissance, and has been specially designed by Mr. Owen W. Davis. A cassone, facing the entrance, is reproduced from an old Florentine example in the Royal Palace at Naples, and it is enriched with a painted frontal panel on gilt ground, in allegorical portrayal of the departure of Columbus from Spain, by F. Hamilton Jackson. The remainder of the settees, tables, and chairs are designed on similarly ancient lines, some of the carvings being copied from examples that belonged to the great Medici family, now in the Pitti Palace at Florence.

The Reception Room.—The modelled plaster ceiling is reproduced from that in the banqueting hall at Crewe Hall, the seat of Lord Crewe, and one of the finest examples of Elizabethan architecture in England. The oak panelling and ingle-nook were specially designed by Col. R. W. Edis, F.S.A.; and the carved and inlaid furniture, designed or drawn from existing examples by Mr. Owen W. Davis, while not of a single period, represents the gatherings together of several generations, and has an affinity running throughout which brings the whole into harmony. In the many and varied pieces in this apartment, Penhurst, Haddon Hall, Hardwicke, Ham House, Speke Hall, Knole House, and Hampton Court are all represented, and other selections are taken from the Louvre and Cluny Museums in Paris, and our own Museum at South Kensington, all being old ideas, but in some cases adapted to more modern requirements.

The Library is entirely of oak, and partakes of a more sedate character. The ribbed ceiling of geometrical form, the bookcases extending from floor to ceiling, and the panelling generally have been executed from drawings by Col. Edis; and the furniture, as in the reception room, has either been designed or adapted from old examples by Mr. Owen W. Davis, each individual piece being, as nearly as its requirements would admit, a faithful rendering of some old master's conception.

The Dining Room (or Waiting Room).—The modelled plaster ceiling is reproduced from the famous one in Campden House, Kensington; and the carved oak panelling and furniture, illustrating a simpler treatment of a modern dining room of Elizabethan character, was designed by Mr. W. C. Codman. The embossed

leather on the walls was first executed for the new ball room at Sandringham Hall, for H.R.H. the Prince of Wales.

In carrying out the decoration and furnishing of the Victoria House, the following firms have rendered great assistance to Messrs. Johnstone, Norman & Co., by supplying or specially executing decorative art work of their respective manufactures, viz:—Messrs. Jeffrey & Co., London, the embossed leather on walls of staircase and waiting room, and the whole of the papers used throughout the building. Messrs. Yates & Co., Wilton, near Salisbury, the hand-made real Axminster carpets in the principal rooms. Messrs. Starkie, Gardner & Co., London, the electric light fittings, and wrought iron locks and hinges for woodwork in principal rooms. Messrs. Feetham & Co., London, the dog stoves and fireplace fittings in entrance hall and reception room. Messrs. Campbell, Smith & Co., London, the three painted glass windows on the staircase.

Steel & Garland, Wharncliffe Works, Sheffield.

The grates and overmantels in Victoria House.

Tooth & Sons, Arthur, 5 & 6, Haymarket, London, S.W.

Engravings in Victoria House.

Treloar & Sons, 68, 69, 70 Ludgate Hill, London, E.C.

Mats in the Section.

Willans & Robinson, Limited, Thames Ditton, Surrey.

The engines driving two of the three lines of main shafting running through the British section. These engines are Willans' Patent Central-Valve Engines, of 360 and 165 indicated horsepower respectively. They are *single-acting*, all the brasses being kept constantly in compression, or "in constant thrust" (instead of being alternately *pulled* and *pushed*, as in ordinary engines), with the object of enabling them to run with smoothness and silence at extremely high speeds; the normal speeds of the two engines shown being, for instance, 350 and 380 revolutions per minute respectively. To scientific engineers the engine is well-known from the two series of trials carried out by its inventor, the late P. W. Willans, described in papers read by him before the Institution of Civil Engineers in London, in the discussion of

which various American engineers took part. The economy figures given by those trials are still "record figures," the consumption falling as low as about $18\frac{1}{2}$ lbs. per indicated horse-power per hour non-condensing, and to 12·6 and 12·8 lbs. condensing. The engines were in both cases triple-expansion, with high steam pressure (170 lbs.), but they were very small, indicating less than 40 horse-power, and running at 400 revolutions per minute. The larger engine shown has three cranks, and is of the standard "I. I. I." pattern; the smaller one, with two cranks, is of "H. H." size. The single-acting "constant thrust" engine is distinctively an English exhibit, as, although known in America, it was extensively used in England (in the form of an earlier type of the Willans' engine) for several years before it was taken up there. English experience of it, in fact, extends over nearly twenty years.

Another engine, of 300 indicated horse-power, is also shown, coupled direct to A. Siemens Brothers' (English-made) two-pole dynamo, capable of giving 180 kilowatts, or 200 if required. The present machine is armed to give 1,600 ampères and about 112 volts, at 350 revolutions per minute. This is a typical English central station plant, ten similar sets constituting, for instance, the plant in one of the latest stations in London, in which city there are now direct-coupled sets of this pattern (but mostly of 200 indicated horse-power each) to the extent of considerably over 25,000 horse-power. The dynamo is entirely typical of English practice. The *combined* efficiency is about 85 or 86 per cent.—that is to say, that for each 100 horse-power *indicated*, 85 or 86 *electrical* horse-power is obtained at the terminals of the dynamo, the combined friction losses of the engine and dynamo, and electrical losses in the latter, amounting to 14 or 15 per cent. In plant such as that shown, with compound engines, the consumption of steam per electrical horse-power per hour is about 24 lbs. non-condensing; with triple-expansion condensing engines of the same pattern, it falls to barely 15 lbs. Though exhibited by Messrs. Willans & Robinson, Limited, the makers of the engines, this plant has been lent by Messrs. Siemens Brothers, Limited, of Woolwich, England, to whom it belongs.

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Department E.

AGRICULTURE, FOOD AND ITS ACCESSORIES, FORESTRY
AND FOREST PRODUCTS, MACHINERY AND APPLIANCES.

AGRICULTURE.

BY ERNEST CLARKE.

It is impossible, within the limits of this brief introduction, to give more than the barest outline of the distinguishing features of British Agriculture. The climate of Great Britain, though generally temperate, is exceedingly varied, and the temperature is subject to sudden changes. The comparative mildness of the winter, however, and the abundance of moisture, greatly favour the growth of pastures and of fodder and root-crops. From their contiguity to the Atlantic Ocean, Ireland and the west coast of Great Britain are subject to much greater humidity than the east. The average rainfall on the west coast and in Ireland is double, and sometimes treble, that which is met with upon the opposite side. From this cause the western counties are chiefly devoted to pasturage and stock raising, and the eastern counties of England and Scotland to the cultivation of cereals. Not less variable is the nature of the soil. Almost every geological formation is represented; often a great diversity of soil is found upon a single farm. Stiff clays, light loams, chalky hillsides, alluvial meadows, barren heathland, give rise to endless variety in the nature of the husbandry and the characteristics of the live stock, whilst proximity to populous centres of mining or manufacturing industry, in conjunction with other causes, tends still further to diversify the conditions of British agriculture.

In dealing with statistics, the relatively small area of the United Kingdom to the United States or to Continental countries must be remembered. The total area of land and water within the British Isles is 77,642,099 acres; in Great Britain alone it is 56,742,508 acres. In 1892 the total acreage under all kinds of crops, bare fallow, and grass was, for the United Kingdom, returned at 47,977,903 acres, and for Great Britain at 32,685,550 acres. The remaining surface is made up of mountain-land, forests, woods, plantations, and land occupied by roads, railways, and towns, and water. In 1891 the woodlands of the United Kingdom were estimated at 3,000,000

acres. In 1892 a special inquiry indicated as the approximate extent of hill-grazing in Great Britain a surface of over 12,000,000 acres beyond the cultivated area.

The acreage, as returned on June 4th, 1892, of the principal crops in Great Britain (including England, Wales and Scotland) and in the United Kingdom (including the Isle of Man, and the Channel Islands) was returned as follows:—

GRAIN CROPS.		GREAT BRITAIN.	UNITED KINGDOM.
		Acres.	Acres.
Wheat		2,219,839	2,298,607
Barley		2,036,810	2,220,243
Oats		2,997,545	4,238,036
Rye		48,103	61,392
Beans		311,310	315,413
Peas		194,424	195,010
Total		7,808,031	9,328,701
ROOTS AND GREEN CROPS.		Acres.	Acres.
Potatoes		525,361	1,276,835
Turnips and Swedes		1,937,163	2,245,998
Mangel		361,235	413,334
Cabbage, Kohl-Rabi, and Rape		150,992	198,895
Vetches or Tares		198,678	204,399
Other green crops		96,148	127,654
Total		3,269,577	4,467,115
HAY AND PASTURE.		Acres.	Acres.
Clover, Sainfoin, & Grasses under rotation	{ For Hay . . .	2,135,362	2,772,065
	{ Not for Hay.	2,537,440	3,201,391
Total		4,672,802	5,973,456
Permanent Pasture or Grass	{ For Hay . . .	4,489,626	6,018,308
	{ Not for Hay.	11,868,524	21,515,018
Total		16,358,150	27,533,326
MISCELLANEOUS.		Acres.	Acres.
Flax		1,421	72,065
Hops		56,259	56,259
Small Fruit		62,148	62,547
Bare Fallow		457,162	484,434

The total produce and average yield per acre of wheat, barley, and oats in Great Britain was for 1892 estimated as follows, the wheat yield in that year being abnormally low:—

	Total Produce. Bushels.	Average yield per acre. Bushels.
Wheat	58,560,932	26·38
Barley	70,501,562	34·61
Oats	116,294,989	38·80

The average yield of wheat in Great Britain is a little over 30 bushels per acre; the weight of the bushel varies between 57 pounds and 64 pounds, according to the season. The quantity of wheat sown per acre is usually from two to three bushels. The average yield of barley is about 33 bushels per acre, and of oats about 39 bushels per acre. Wheat is chiefly grown in the eastern, midland, and southern counties of England; the counties having the largest wheat acreage are those of Lincoln, Cambridge, Norfolk, Suffolk, and Essex, all of which are in the east of England. This cereal has hitherto been regarded as the staple crop of English agriculture. During the last decade, however, its cultivation in the United Kingdom has steadily declined from 3,163,899 acres in 1882 to 2,298,607 acres in 1892. Barley, in the form of malt, is mostly used for the brewing of beer and the manufacture of spirits; the grain is also used in the fattening of live stock. The staple grain crop of Scotland is oats, and oatmeal is largely used as food by the people. In England oats are employed for feeding horses and other live stock. Rye, formerly used by the peasantry for bread-making, is now little grown save as a green “catch crop” to be fed off by stock in early spring.

In Ireland the chief crops are oats and potatoes. In 1892 the acreage of the former was 1,226,307 out of a total grain acreage of 1,494,816. In 1892, the acreage under potatoes was 739,942. Flax is also cultivated in the north of Ireland. The acreage under flax in 1892 was 70,642, but the average acreage of recent years is about 102,000. Too large a proportion of the Irish population, which, according to the census of 1891, numbered 4,704,750, are dependent upon the soil as it is at present cultivated. Ireland is a rich grazing country, but much of the soil still needs draining.

The extensive acreage under roots in Great Britain will not be regarded as surprising when considered in connection with the

number of live stock which they help to feed.* Mangel-wurzel, turnips, swedes, and sometimes cabbages are grown for the feeding of stock during the winter. The roots are either carefully stored in heaps for protection from frost, and, mixed with dry fodder, are used in the cattle sheds and sheep troughs on pasture land, as required ; or they are left in the field and folded off with sheep. In the latter case, the land gets consolidated and manured, though the roots may not be quite so economically eaten, and they are liable to suffer from frost. The introduction of turnips into field cultivation in Great Britain about the middle of the eighteenth century marks an epoch in British farming. It has stimulated the raising of live stock, and by the use of roots in the crop rotation, the fertility and productiveness of the soil have been greatly increased.

Dairying is one of the most important of British agricultural industries ; and when it is stated that butter to the value of £11,965,284, margarine to the value of £3,712,884, and cheese to the value of £5,417,777, are annually imported from abroad, it is evident that there is considerable room for the further development of this trade at home. It has been lately calculated, though from unofficial data, that the total consumption, in the United Kingdom, of milk, inclusive of milk-products, reaches annually 2,546 million gallons, of which 1,417 million gallons are produced at home. The principal makes of cheese are Cheddar, Stilton and Cheshire. The centre of Cheddar cheese-making is in Somerset and Wilts, with another centre in the south-west of Scotland. Stilton cheese is made from the rich pastures of Leicestershire and the adjoining Midland counties ; Cheshire cheese is made in Cheshire and adjoining counties.

Besides the staple crops that have been noticed, various local agricultural industries must be mentioned. Thus, hops for brewing beer are grown in the counties of Kent, Sussex, Surrey, Hants, Worcester, and Hereford, and to a limited extent in other counties. The total acreage under hops in 1892 was 56,259, which yielded a total produce of 413,259 cwt., an average of 7.35 cwt. per acre. Hop-picking in the season gives employment to numbers of the poor from the East-end of London. In Kent also, apples, pears, plums, cherries,

* British live stock is dealt with in the introduction to the Live Stock Catalogue.

and nuts are grown for the London market. Middlesex, Surrey, Gloucester, and Worcester are likewise fruit-growing counties. Apple orchards for cider-making abound in the counties of Devon, Somerset, Gloucester, Monmouth, Hereford, Worcester, and Norfolk. Perry is made in the counties of Hereford, Worcester, Gloucester, Somerset, and Devon. The growth of vegetables for the markets of London and other large cities, especially in Lancashire and the West Riding of Yorkshire, is an important and increasing industry. The total acreage of market-garden land in Great Britain increased from 40,582 in 1879 to 81,368 in 1891. In the Channel Islands of Jersey and Guernsey a very large trade is done in the exportation of early potatoes for the London markets. Other vegetables, such as broccoli, tomatoes, peas, beans, cucumbers, are also grown in the Channel Islands for export, as well as enormous quantities of fruit of various kinds.

Around Luton in Bedfordshire, and in parts of Herts, Bucks, Oxon, and Berks, wheat-straw is grown for plaiting. In favourable seasons straw for this purpose will realize from £6 to £8 per acre, which is in addition to the price obtained for the grain.

The fences commonly employed in Great Britain are white-thorn hedges, stone walls, and wire, the first-named being the most general. No American visitor to the British Isles can fail to be struck with the contrast presented by the English hedgerows to the immense stretches of unrelieved prairie or arable land in many parts of his own country. The practical utility of hedgerows is that they serve as wind-breaks and afford shelter to the flocks and herds; yet it is a question whether the enclosures are not in many cases too small, and whether a large amount of hedgerow space might not be redeemed.

The practice of mixed husbandry (*i.e.* the combination of arable with pastoral farming) is followed upon most of the farms in Great Britain. An arable farm is generally defined as that upon which at least two-thirds of the acreage is under the plough.

The hay harvest takes place in June or July. In bad weather and in districts of heavy rainfall the practice of ensilage is now largely resorted to.

It is computed that there are altogether about 1,481,000 land-owners and farmers in the United Kingdom, and about 1,500,000 farm labourers. The occupiers of lands in the United Kingdom number

about 1,048,000. Of these, 521,000 are in Great Britain, with an average holding of about 63 acres each, and 527,000 in Ireland, with an average holding of about 28 acres each. According to a return presented to Parliament in 1886, the number and size of the farm holdings in England and Wales is as follows :—

Area in Acres.	Number of Farms.
50 to 100	54,937
100 to 300	67,024
300 to 500	11,841
500 to 1,000	4,194
Over 1,000	573

Farms are held from owners either by yearly tenancies, terminable by twelve months' notice, or upon leases of 7, 14, or 21 years' duration. The leasehold system generally prevails in Scotland, in the northern counties of England, in West Norfolk, and in Lancashire. It does not prevail upon more than about 10 per cent. of the farms in Great Britain, the remainder being held upon yearly tenancy. Both systems have their advantages, and both their disadvantages. Under the security of tenure afforded by a lease, the Scottish farmers have in the past materially benefited. On the other hand, as a general rule, yearly tenants in England have practically enjoyed the advantages which a lease confers, through a tacit understanding between owners and occupiers by which farms have remained in the same families for generations.

The rotation of crops most generally adopted is that known as the Norfolk or "Four Course" system. It consists of (1) wheat, (2) roots, (3) barley, and (4) clover. The principle of this arrangement is that two exhausting grain crops shall not follow each other; but in other respects the rotation admits of a great variety of modifications, especially in extending its length by allowing the clover or "seeds" to remain down two or more years. The wheat, which is sown in the autumn, is harvested, say, in the following August, after which the land is as soon as possible ploughed, and allowed to lie fallow until the ensuing spring. It is then re-ploughed, cleaned, and prepared for turnips, or other root crop. The roots are fed off during the ensuing winter, and in the spring barley or oats are sown; later, the crop is intersown with clover, into which may be turned either horses, cattle or sheep, immediately after the grain crop has been harvested. The clover usually remains down for a year, or

sometimes for two years, when wheat again takes its place in the rotation.

It has long been the custom, in the agreements for the letting of land, to provide against depreciation of fertility by the insertion of restrictive clauses in respect of the system of culture pursued. Among such prohibitory clauses are the following : Two grain crops may never be taken in immediate succession ; no hay, straw or turnips may be sold off the farm except under special circumstances and conditions ; only certain limited quantities of potatoes or flax may be grown ; arable land shall be two or more years in grass. These restrictions are based upon the idea that the farm must maintain its own fertility. They have hitherto, no doubt, served a useful purpose in preventing the exhaustion of the soil through either the ignorance or the cupidity of the cultivator. But the extensive use of artificial manures places a different complexion upon the matter. Peruvian guano is still imported annually at the rate of 25,000 tons ; Liebig's grand discovery of the preparation of superphosphate of lime from bones added another important means of maintaining fertility, and was closely followed by that of Lawes in the obtaining of superphosphate from purely mineral sources. The annual average importation of bones is about 70,000 tons. Other manures, such as potash-salts, nitrate of soda, sulphate of ammonia, lime, marl, chalk, soot, &c., are also largely employed. The annual average quantity of imported manures and fertilizers is 462,000 tons, of the value of £1,339,000. The estimated consumption of home-made manures is 570,000 tons. So that, taking these facts into consideration, together with the scarcity of tenants, and the more general knowledge of scientific principles, landowners are daily finding it to their interest to allow their tenants greater latitude of discretion as to conditions of culture.

Allusion should be made to the state of agricultural organization in Great Britain, by which is meant the influence exercised upon agriculture by imperial and local government, by agricultural societies, and by experimental stations. Compared with other nations, it is remarkable how little in Great Britain is due to State-aid. Whilst large sums have for years been annually voted by Continental governments for agricultural experimental research, for agricultural education, and even for bounties to native produce,

British agricultural progress has been due to voluntary associations or to private individual exertion. In 1889 the Board of Agriculture was created, with a President directly responsible to Parliament. To the new Department was entrusted the collection of the agricultural statistics, the administration of the small government grants in aid of technical agricultural instruction and experimental research, the administration of the Contagious Diseases of Animals Acts, and all matters connected with land, such as commons, inclosures, tithes, copyholds, drainage, buildings, etc., as well as the Ordnance Survey.

The Royal Agricultural Society of England, originally founded in 1838, exercises many functions analogous to those which are in other countries performed by the State. For instance, the Society holds annually, in different districts of England and Wales, taken in rotation, a National Agricultural Exhibition, at which are offered valuable prizes for British breeds of live stock and for agricultural implements and produce. The present excellence of British live stock is largely due to the Society's encouragement. The Society's competitive trials of implements have stimulated invention and enterprise, as the scientifically constructed agricultural appliances of to-day eloquently testify. The Society's other operations embrace practically every department of rural economy: the chemical analysis for its members of manures and feeding stuffs, veterinary science, agricultural education, diseases of plants, insect and other pests, and practical agricultural experiments upon an experimental farm. The Highland and Agricultural Society of Scotland, founded in 1784, is an institution performing for Scotland kindred functions to those of the Royal Agricultural Society for England and Wales. In Ireland agriculture is fostered by the Agricultural Department of the Irish Land Commission and by a department of the Royal Dublin Society, in which the Royal Agricultural Society of Ireland became merged in 1887. The Annual Horse Show of this Society, held in Dublin in the month of August, is one of the largest and most important of its kind.

Besides the national societies named, there exist a large number of independent district or county associations, each of which holds its own local show of live stock and implements.

The political interests of agriculture are watched over by the Central Chamber of Agriculture—a body formed mainly of elected

representatives of provincial Chambers of Agriculture and Farmers' Clubs. The Smithfield Club is an old-established institution for the encouragement of fat stock. Nearly every breed of live stock has now its particular stud-herd- or flock-book society, and there has been a large increase of such societies within recent years.

A great impetus has been given to technical agricultural education since 1889 by the allocation to this purpose of Imperial grants administered by the County Councils. By means of these grants lectures in various departments of rural economy, butter-making demonstrations, and other kinds of dairy instruction have been largely organised, and bid fair to accomplish useful work.

The present year witnesses the Jubilee of the world-renowned Rothamsted experiments, which were commenced in 1843 by Mr. Lawes (now Sir John Lawes, Bart.). Dr. Gilbert joined Mr. Lawes as chemist and colleague in the same year. Sir John Lawes has recently created a munificent Trust of £100,000 for the perpetuation of his experiments.

At the present time British agriculture is suffering from great depression. The severity of the crisis is partly due to the prevailing low prices of grain and the great fall in the prices of other agricultural products. The causes publicly assigned for the present depression are numerous, as *e.g.*, foreign competition, free trade in corn, excessive taxation both imperial and local, complicated land laws, dear freightage, and the existing monetary system. It is noteworthy that, in spite of the great decrease in the prices both of wheat and stock, no appreciable difference is made in the prices charged to the consumer. This is a fact suggestive of the unduly large proportion of profits which is at present monopolised by the "middleman" or dealer. The remedies proposed are: a return to protective duties on corn and imported manufactured articles; bi-metallism; reduced railway rates; the creation of peasant proprietorships or of small holdings; reduction of rents; and other expedients more or less feasible. Rents have already been reduced from 10 to 50 per cent., and in some cases to vanishing point. It is a question whether, if all the panaceas proposed were simultaneously adopted, there would be any appreciable mitigation of the evil, which is mainly due to the low prices of produce—especially of grain.

The present outlook for British agriculture is therefore gloomy. It is the growers of grain who are amongst the principal sufferers, and if the low prices continue, it will be necessary for British arable farmers to turn their attention, as many have already done, to more remunerative crops. As in the past, so in the future, the agriculture of Great Britain will, doubtless, eventually adapt itself to changing circumstances, and the British farmer will strive to overcome his adversities and misfortunes by opening up for himself new fields of successful enterprise.

FOOD AND ITS ACCESSORIES.

BY RICHARD BANNISTER.

To satisfy hunger and quench thirst are the primary instincts of animal life. These sensations of craving or want lead the animal to seek for food and drink; and in the satisfaction of the appetite material is supplied which renews or builds up some structure, or maintains some vital process. The animal body, whether at rest or at work, is constantly wasting, and every vital action can only be carried on at its expense. The objects, therefore, for which food is taken are various. It must build up the tissues of the body during growth, repair them in middle life and old age, and store up a sufficient reserve of energy to carry on the general functions of life. The possession and retention of health is the aim of the savage as well as of the most civilized; and experience has taught both what descriptions of food are most suitable for the attainment of this object, in different conditions and circumstances of life.

Scientific research in every civilized nation has been directed to this important subject, and the chemical composition, the mode of preparation, and the physiological effects of foods have been studied and the results classified for general use. It has been proved that water, albuminoids, carbohydrates, and a small proportion of mineral matter make up the sum of a perfect food; and in milk—the typical perfect food—we have this combination, but the quantity of water in it is too great for the food of adults, who are able to obtain water from other sources.

The physiologist has divided foods into two classes, viz., those which directly supply all our nourishment, and those which increase vital action in excess of the nutritive material they supply. Foods

may therefore be either partial or complete, and may thus be divided into simple and compound foods. They can also be classified according to the ease with which they can be digested, the flavour, or the low price at which the necessary nutriment can be supplied from the cheapest sources ; but the general classification is directed to show what foods generate heat, and what produce and maintain the structures of the body under the influences of life and exertion. Such divisions cannot be sharply made, on account of the many substances which overlap the border-line on one side or the other ; but the knowledge we possess enables us to make proper allowances, and to form combinations of food or dietaries suitable to most circumstances of life, climate, and seasons. The foods we possess are derived from all divisions of nature, and their distribution is world-wide. The same classes of elements are found in vegetables and animals, but the latter store up in a concentrated form what they have derived from the vegetable kingdom, and thus become a condensed food supply. - The advance of civilization and the facilities afforded for travel and commercial intercourse have enlarged the wants of mankind ; and the increase of wealth, with an advance in the purchasing power of the community, have tended to make the luxuries of a few years ago the actual wants of to-day. The telegraph, the railway, and other improved methods of communication have made the world one huge market, and its products are at the disposal of the wealthy. Corresponding improvements have been made in the methods of food preservation, and thus the surplus products of one country can be transported to another where they are needed for consumption. These facilities make us independent of seasons, for vegetables and fruits, either in their natural condition or preserved, are brought from long distances and made accessible all the year round.

The effect of this movement is to level prices and to cripple or destroy old industries ; but it benefits the masses by placing within their reach at a low price goods of colonial or foreign production, and gives them a choice of dietary which old largely-populated countries could not otherwise possess. With the extended range of our food supply and the advance of education the art of cookery has been necessarily cultivated. Food is thereby presented for consumption in its most attractive forms, and the senses of smell, sight and taste

are requisitioned to stimulate the appetite and make eating a pleasing as well as necessary occupation. This wealth of choice has also created many artificial wants which, from being regularly supplied, have crystallized into necessities. Old lines are thus defaced, and many food accessories have become necessities, either from their appeal to the appetite or because their composition fits them so to be.

Bread and flesh meat are more or less the diet of the world on account of their general distribution; they consequently demand primary attention.

Bread is generally made from wheat flour on account of the peculiar condition in which the nitrogenous matter exists in it. Through this peculiarity, it will, when mixed with water, remain in a spongy open condition at the temperature of the baking oven. The bread can be leavened with ordinary leaven, but wherever yeast can be procured, it is used for the purpose. Formerly beer yeast was generally employed, but on account of its hop-bitterness and the uncertainty of its vitality, foreign yeast produced at rye-distilleries has been substituted for it. Revenue restrictions have interfered with its production at the home spirit distilleries, but relaxations of the regulations have now been made, and the home manufacture is becoming an important industry.

The quantity of foreign yeast imported last year was nearly 12,000 tons, and its value £611,141.

On account of its bulk and perishable nature, bread is only suited for quick consumption. Biscuits (crackers) have to be substituted for it when required for stores, but they must be protected from the atmosphere. Biscuits are of two classes, plain (bread substitutes) and fancy; but the quantity exported last year only reached 216,920 cwts. Owing to the large importation of wheat, its manufacture into flour has gravitated to large towns. Steam has been extensively substituted for water power, and, though the cost of grinding has thereby been increased, the cost of distribution has diminished. This change has placed milling operations in the hands of capitalists, who have provided themselves with the best machinery, with the result that more flour of better quality is now obtained from the wheat operated upon than formerly. Excellent flour is also largely imported, and the competition between the home and foreign miller has been of great benefit to the consumer both as regards price and quality.

Pastes and starches are generally imported, on account of the high price of the raw material to be operated upon affording no margin for profit.

The quantity of wheat grown at home last year was one and a half million tons ; of wheat and flour imported four and a third million tons.

Milk and sugar must alike be treated as foods, for the world's consumption of sugar is so great that it must be considered a necessary of civilized life.

Strict sanitary regulations compel the town population to depend on a country milk supply, and this has been greatly facilitated by rapid transit and improved preservation, coupled with severe foreign competition in the butter and cheese market. The result is that milk is much more largely sold as such than was formerly the case. Milk is now expeditiously deprived of cream—an article in good demand—by the centrifugal separator, and the remainder, known as separated milk, is sold cheap in large towns or used in biscuit making. Owing to the minute organisms which cause the souring of milk having been forced out with the cream, this separated milk keeps better than ordinary milk : hence it is used as an adulterant by dishonest dealers. When milk cannot be disposed of fresh it is either condensed or made into butter or cheese ; and to this end associated dairies on co-operative principles, and central factories, where butter from various sources is re-made to secure uniformity, are common, though more so abroad than in Great Britain. The home manufacture of cheese is diminishing, the American cheddar being so good in quality and low in price that it has pushed aside our own hard curd cheese, and only soft curds of special makes continue to hold their own.

					Cwts.		Cwts.
The Quantity of Butter imported in 1892 was					2,182,999	Exported	14,070
„	„	Cheese	„	1892 „	2,232,814	„	11,371
„	„	Margarine	„	1892 „	1,305,350		

The British tropical colonies until recently furnished our staple supply of sugar. Lack of fuel and of a constant water supply permits only the commoner kinds to be made on the spot ; the refining is done after importation. To prevent decomposition the juice must be treated as soon as it is pressed from the cane ; even with due care the ordinary product is of low quality. The vacuum pan has greatly improved matters, and the large crystallised Demerara commands a price equal to that of good loaf.

During the French war sugar could not be brought to European ports; the sugar beet industry sprang up and was protected and fostered, and now receives bounty on export large enough to almost destroy the British refining industry. London, formerly the centre of refining, has now but two or three makers of loaf sugar, other refiners producing pieces, crushed goods, and sugar for brewers' use. Syrups for consumption are usually made from the cane; the beet, on account of its offensive smell, being unsuitable. Glucose sugar in solid and liquid condition is largely used by brewers and jam makers; the greater part of the liquid sugar is, however, imported. The cheapness of sugar has contributed to the marked progress made in the manufacture of confectionery; and the general quality is excellent, poisonous colourings being prohibited. The quantity of sugar imported last year was: refined, 10,624,203 cwts.; unrefined, 16,295,647 cwts. Of the unrefined, 8,286,213 cwts. came from Holland, France, Belgium, and Germany, and was, no doubt, beet.

Meat, being a concentrated food in general use, is in such demand that our home supply is not sufficient for our requirements. Sun-dried and salt meats do not appeal to the public taste, and other methods of preservation have had to be devised. Refrigerating chambers in steamships have enabled us to obtain fresh meat from our colonies at a very low price; and canned meat is in demand for home use, and also for any purpose where cooked fresh meat is required for consumption in warm climates, or away from any other source of supply. The same remarks apply to fish and poultry. Great care is exercised in using only the best material for making and soldering the tins, and there is, consequently, little danger of unsoundness in the contents of the tins, or of contamination with poisonous metals. The imports of meat last year were: 585,111 live cattle, estimated value, £9,360,715, and 10,607,739 cwts. of dead meat, valued at £22,359,162.

Of the various food accessories, tea, coffee, cocoa, tobacco, whisky and beer demand special attention. The first four are of foreign origin, but unsuccessful attempts have been made to grow tobacco on a commercial scale in Great Britain. The duty on unmanufactured tobacco imported is more than four times the average value of the tobacco itself; it has therefore been necessary for the protection of the revenue to prohibit its home cultivation. The quantity (manufactured and unmanufactured) imported for

home consumption last year amounted to 63,722,348 pounds; the estimated value, £3,574,194; and the duty, £10,284,134. Ninety-six per cent. was unmanufactured tobacco, which had to be manufactured here for consumption. The revenue laws are stringent; no substance other than water (and oil in spun tobaccos) is allowed, and even this has to be strictly limited in amount. Large capital and much skill are essential in the tobacco manufacturing industry, on account of working on duty-paid raw material. American sun-dried leaf is in great demand for light-coloured fancy tobaccos; but sweetened tobacco, for chewing purposes, is not in demand, and can only be imported or manufactured in bond under special regulations.

Tea has been imported from China for 250 years, but during the last forty years it has been cultivated in India, and more recently still in Ceylon. British-grown tea, on account of its special qualities, is in general demand; but nearly all the tea imported appears to be grown for quantity, not for quality, and the curing is defective. China now supplies only about one-sixth of the tea used in this country. Coffee, which is an expensive beverage and difficult of preparation, is steadily decreasing in consumption. Tea, however, is rising in favour, as it is easy to prepare by the most inexperienced. Cocoa contains naturally about half its weight of fat; it is, therefore, difficult to make an infusion direct from the bean. The fat is consequently either reduced in quantity by heat and pressure, or to the ground cocoa is added starch, easily gelatinized by heat, sugar, and flavouring matters. From either of these preparations a beverage is easily prepared. Cocoa is also eaten in many forms as a confection, and under the name chocolate is a favourite sweetmeat.

The quantity of tea, coffee, and cocoa imported for home consumption last year was:—

	Lbs.
Tea from British possessions.	172,630,296
„ China and other countries.	34,483,408
Coffee	28,851,088
Cocoa	20,795,798

The manufacture of alcohol is a large industry, branching out in many directions. Plain strong spirit may be used as such or may be flavoured and redistilled, the products being gin, liqueurs, cordials, bitters, and other alcoholic compounded beverages.

The manufacture of whisky is almost entirely confined to Scotland and Ireland. It is made from malt, or from a mixture of malt

and raw grain, the malt being, in the case of Scotch whisky, wholly or partially dried with peat, which imparts its special flavour. The whisky is matured in casks, and, when fit for consumption, is sold in bulk or bottled.

The quantity of spirits charged with duty last year was 32,161,901 gallons. Our exports amounted to 3,810,325 gallons.

Cider making is a decaying industry, confined to certain apple-growing districts. Cider is not a popular beverage, and its consumption is declining.

Rum is made from sugar plantation refuse, the best being produced where the sugar is crude and the residue consequently high in quality. It has been said that Jamaica rum obtains its good quality at the expense of the bad sugar, and that the good quality of the Demerara sugar is obtained at the expense of its bad rum. The home consumption of rum was last year 4,268,460 proof gallons.

Malt liquors are largely manufactured for home consumption and export, the quality of British beer being known throughout the world. The malt duty was in 1880 transferred to beer, and since that date investigations into the composition of malt and beer have been made by practical brewers and chemists, the result being that the chemistry of brewing has greatly advanced. The changes in the composition of grain during malting, and the chemical and other effects produced in the mash-tun and fermenting back have been practically studied. The quality of the beer made is better, and the top fermentation for home consumption holds its own against the German method of bottom fermentation at a low temperature. British beer is specially suited for exportation in bulk, and it will also keep in bottle without being heated to destroy the foreign ferments present. Black beer (porter and stout) is in great demand at home and abroad. It is prepared with roasted or high dried malt, and considered highly suitable for invalids. Hops in different proportions are used in making all British beers. The beer charged with duty was last year 32,201,167 barrels; 569,615 barrels were exported, and 36,204 barrels of foreign beer imported.

The consumption per head of population of the accessories mentioned was :

	Tobacco. lbs.	Tea. lbs.	Coffee. lbs.	Cocoa. lbs.	Spirits. gallons.	Beer. gallons.
1882	1·42	4·6	·88	·34	1·047	27·6
1891	1·60	5·3	·75	·57	1·034	30·1

DEPARTMENT A.

AGRICULTURE, FOOD AND ITS ACCESSORIES,
FORESTRY AND FOREST PRODUCTS, MACHINERY
AND APPLIANCES.

*Unless otherwise stated, the Exhibits in this Department are in the
Agricultural Building.*

GROUP I.

CEREALS, GRASSES AND FORAGE PLANTS.

- 1 Garton, R. & J., *Agricultural Experiment Grounds, Newton-le-Willows, Lancashire.*

Exhibit of ears and grain, the progeny of results of experiments carried on at above grounds during the last 13 years in the improvement of the cereals of all the principal corn-growing countries of the world by a prolonged course of artificial fertilisation and selection in their several classes.

- 2 Hill & Sons, R. R., *Steam Mills, Drogheda, Ireland.*

Oatmeal.

[See Advt.]

- 3 M'Cann, John, *Beamond Mills, Drogheda, Ireland.*

Oatmeal.

[See Advt.]

- 4 Mold, W. H., *Bethersden, Ashford, Kent.*

Samples of wheat and oats; one root of wheat, the produce of one grain, with 76 heads with about 4500 grains.

Bowmore Distillery Co. See GROUP XI.

Crosse & Blackwell, Limited. See GROUP VI.

Keen, Robinson, & Belleville. See GROUP XXIII.

Plunkett & Co., John. See GROUP XII.

Power & Co., Sir John. See GROUP XI.

GROUP II.

BREAD, BISCUITS, PASTES, STARCH, GLUTEN, &c.

- 5 Parkinson & Sons, R., *Curzon Street, Burnley.*

Baking, custard and egg powders.

See baking machinery, GROUP LXXIX.

Birmingham Vinegar Brewery Co., Limited. *See* GROUP XXIII.

GROUP III.

SUGARS, SYRUPS, CONFECTIONERY, &c.

- 6 British Bee-keepers' Association,** *17 King William Street, Strand, London, W.C.*

Representative collection of 1000 pounds of extracted honey, contributed by 100 bee-keepers and members of the British and affiliated Associations; books, pamphlets, diagrams, and lantern slides, published or used by the certificated lecturers and experts of the association, in connection with technical instruction in bee-keeping, for which public grants are made; reports, 1880-1892; medals and certificates.

- 7 McNally, Ebenezer,** *Ten Acres and Stirchley Street Co-operative Society, near Birmingham.*

Samples of English, Irish, and Scotch honey, beeswax in various forms; goods manufactured with honey, viz., biscuits, confectionery, wines, medicines.

- 9 Wood Brothers & Boyd,** *Newcastle, New South Wales.*

Samples of Queensland sugar.

See confectioners' machinery, GROUP LXXIX.

Fry & Sons, J. S. *See* GROUP VIII.

Jackson, Thomas. *See* GROUP LXXXVII.

Stevenson & Howell. *See* GROUP LXXXVII.

GROUP VI.

PRESERVED MEATS AND FOOD PREPARATIONS.

- 10 Bovril, Limited,** *30 Farringdon Street, London, E.C.*

"Bovril," a combination of the stimulative and nutritive constituents of ox beef in specially concentrated digestible forms, as biscuits, wine, jelly, lozenges, cocoa, chocolate, campaigning rations, "bospor" soup powder, "bomalt."

11 Coleman & Co., Limited, Norwich.

“Wincarnis” or Liebig’s extract of meat and malt wine.

12 Crosse & Blackwell, Limited, Soho Square, Charing Cross, and Belvedere Road and Brewery Road, London; Morrison’s Quay, Cork. [See Advt.]

Preserved meats, soups, fish, fruits, vegetables; pickles, sauces, condiments; malt vinegar; dried grains.

13 King & Co., Limited, Frederick, 3 to 6 Camomile Street, London, E.C.; Belfast, Ireland; Agents in New York, Cushman, Brothers.

Edwards’ desiccated soups and preserved potato.

14 Maconochie Brothers, Raglan Works, Lowestoft; Kinnaird Head Works, Fraserburgh; 1 East India Avenue, London.

Preserved fish, meats, soups, fruits, vegetables; pickles, sauces and condiments; malt vinegar; cocoa and spices.

15 Liquor Carnis Co., Limited (The), 55 Holborn Viaduct, and Smithfield Works, London, E.C.; Laboratories, Aston Clinton, Buckinghamshire.

Caffyn’s liquor carnis (meat juice), malto carnis (Caffyn), jelly carnis, carnis suppositories, and “virol,” a fat-forming food and substitute for cod liver oil.

See also preserved fish, GROUP XL.

Edmunds, Joseph. See GROUP XXIII.

Idris & Co. See GROUP X.

Smith & Co., T. & H. See GROUP VIII.

GROUP VII.**THE DAIRY AND DAIRY PRODUCTS.****16 London and Provincial Dairy Company (Proprietors, G. P. Fuller, M.P., and J. J. Watts), Halkin Street West, Belgrave Square, London, S.W.**

New and improved butter churns and other dairy appliances adapted for any climate.

17 Nicholls & Co., William, Rowden Hill, Chippenham, Wiltshire.
Pure fluid extract of annatto.

- 18 Webb, Jubal, *High Street, Kensington, W., and Smithfield, E.C., London.*

Cheese, hams, cream.

See Fair salt, GROUP XLVIII.

GROUP VIII.

TEA, COFFEE, SPICES, HOPS, AND AROMATIC AND VEGETABLE SUBSTANCES.

- 19 British Deli and Langkat Tobacco Co., Limited (The),
13 *George Street, Mansion House, London, E.C.*

Wrapping leaf tobacco grown on the Company's estates in Sumatra, and cigars of British manufacture, wrappers of which consist of same.

- 20 British North Borneo Co. (The), 15 *Leadenhall Street, London, E.C.* [See Advt.]

Leaf tobacco for cigar wrappers, cigars made entirely from tobacco grown in British North Borneo, cigars filled with other tobacco, wrapped with Borneo leaf; various other products grown in the territory; map and illustrated handbook of British North Borneo; stamps, postcards and coins issued under the Company's administration.

- 21 Fry & Sons, J. S., *Bristol and London.* [See Advt.]

Pure concentrated cocoa, chocolate, and chocolate confectionery.

- 22 Lipton, Thomas J., *Bath Street, London, E.C.; and Glasgow, Liverpool, Dublin, Calcutta, and Ceylon.* [See Advt.]

Tea and coffee.

- 23 Rickards Machine Co., Limited, 47 & 48 *Hampton Street, Birmingham.*

Appliances for rolling cigarettes, cheroots and cigar bunches, machines for rolling tobacco leaf into coils or plugs.

- 24 Smith & Co., T. & H., *Edinburgh; and 12 Worship Street, London, E.C.* [See Advt.]

Coffee essences, coffee and milk, cocoa and milk, chocolate and milk; aerated waters.

- 25 Sylhet Tea Gardens (The), 4 *Abchurch Yard, Cannon Street, London, E.C.*

Samples of tea in every stage as grown at Sylhet (Kewacheira) tea gardens.

See table salt, GROUP XLVIII.

Birmingham Vinegar Brewery Co., Limited. See GROUP XXIII.

Edmunds, Joseph. See GROUP XXIII.

Harry & Company. See Indian Exhibits.

Indian Tea Association. See Indian Exhibits.

Maconochie Brothers. See GROUP VI.

Ness & Co. See GROUP LXXXVII.

Nowrojee Framjee. See Indian Exhibits.

GROUP IX.

ANIMAL AND VEGETABLE FIBRES.

26 Combe, Barbour & Combe, Limited, *Belfast, Ireland.*

Samples of hemp manilla, sisal, flax, jute, and ramie, illustrating the condition of these fibres during the various processes of preparing, spinning, twisting, from the raw to the finished state, viz., binder twine, cordage, twines, yarns, threads; photographs of machines used in each process.

26A Victoria Woolgrowers of Australia.

Samples of wool.

Barbour & Sons, Limited, William. See GROUP CII.

Brookfield Linen Co. See GROUP CII.

Cleghorn, Jun., William. See GROUP LXXXIX.

Finlayson, Bousfield & Co. See GROUP CII.

Ness & Co. See GROUP LXXXVII.

GROUP X.

PURE AND MINERAL WATERS, NATURAL AND ARTIFICIAL.

27 Artesian Co., Limited (The), 12 Rutland Square, Dublin, *Ireland.*

Artificial mineral waters, ginger ale (aromatic), lemonade, tonic bitters, kali, lithia, soda, and other waters.

28 Belfast Mineral Water Co., Limited, *York Road, Belfast.*

Ginger ale, lemonade, sarsaparilla, soda, kali and seltzer water, champagne cider,

29 Bradford Coffee Tavern Company, Limited, *Westgate, Bradford, Yorkshire.*

Belfast ginger ale, lemonade, and other aerated waters, punch, a non-intoxicating substitute for brandy, other cordials; soluble essences used in the manufacture of aerated waters.

30 Cantrell & Cochrane, *Belfast and Dublin.*

Mineral waters, aerated beverages, ginger ale, "club ale," "club soda," sarsaparilla, sparkling Montserrat.

31 Corry & Co., William, 114-126 *Cromac Street, Belfast, Ireland.*
[See Advt.]

Aerated beverages, ginger ale (aromatic), lemonade, soda, potass and cromac seltzer waters, sarsaparilla, hot bitters, cromac tonic, cromac kola; raspberry vinegar and lime juice preparations.

32 Denton, Smith, *Manchester Road, Bradford.*

Mineral and aerated waters, also hop ale.

33 Idris & Co., *Pratt Street, Camden Town, London, N.W.*

"Idris" aerated waters, lime juice, fruit cordials, syrups, essences, syphons, seltzogenes, seltzogene powders; "Viking" meat preparations for invalids in glass jars, soups, meat lozenges, sauces, extract of meat.

34 Reginaris, Limited, 110 *Shaftesbury Avenue, London, W.*

Natural mineral waters: "Reginaris," a sparkling table water; "Ferruginaris," a sparkling chalybeate tonic water.

35 Ross & Sons, Limited, W. A., *Belfast, Ireland.*

Ross' Royal Belfast ginger ale, soda water, lime juice cordial, and raspberry vinegar.

36 Shanks & Co., J., *Dublin.*

Dulcamara, or champagne of oranges, an aerated non-alcoholic fruit beverage; hop bitters, or hop bitter beer, a fermented non-intoxicating light beer; ginger ale, an aerated non-alcoholic beverage.

37 Whistley Water Co. (The), *Head Offices: 4 Halkin Street West, Belgrave Square, London, S.W.*

Water from the Whistley mineral springs, known as the "Bottomless Wells," near Devizes, Wiltshire.

Smith & Co., T. & H. See GROUP VIII.

GROUP XI.

WHISKEYS, CIDER, LIQUEURS, AND ALCOHOL.

- 38 **Bowmore Distillery Co.**, *Bowmore, Islay, Scotland.*
Whiskeys (new and old); samples of barley, peat and malt.
- 39 **Brown & Co., Malcolm**, *Distillery, Dundalk, Co. Louth, Ireland.*
Irish whiskey. [See Advt.]
- 40 **Buchanan & Co., James**, *Glasgow; Leith; and 20 Bucklersbury, London, E.C.*
Scotch whiskey.
- 41 **Dewar & Sons, John**, *48 Lime Street, London, E.C.; Perth, N.B.; Tullymet, Perthshire.*
Highland whiskey.
- 43 **Haig, Charles Robert**, *12 Mark Lane, London, E.C.*
Welsh malt whiskeys. [See Advt.]
- 44 **Hopkins & Co., John**, *79 Mark Lane, London, E.C.; 64, Wellington Street, Glasgow; and Tobermory Distillery, Island of Mull, Scotland.*
Scotch whiskey. [See Advt.]
- 46 **Lauder, Archibald**, *70 to 78 Sauchiehall Street, Glasgow.*
Whiskey.
- 47 **McDonald & Sons, D. P.**, *Ben Nevis Distilleries, Fort William, Scotland.*
Pure malt whiskeys. [See Advt.]
- 48 **McCarthy & Sons, J.**, *Cork.*
Irish whiskey, proprietary brands, "Clancarty" and "Irish Potheen."

49 Menzies, James, 68 *Bath Street, Glasgow.*

Scotch whiskey, "Auld Scottie."

50 Nicholson & Co., J. and W., *St. John Street, Clerkenwell, London, E.C.* [See Advt.]

London gin and compounded spirits.

51 Old Bushmills Distillery Co., Limited (The), *Bushmills, Co. Antrim; offices, Belfast, and 3 to 6 Camomile Street, London, E.C.* [See Advt.]

Old Irish whiskey, manufactured from pure malt only.

52 Power & Son, Sir John, *John's Lane Distillery, Dublin.*

[See Advt.]

Samples of whiskey in wood and bottle; samples of native grain used in the manufacture.

53 Thorne & Sons, Limited, R., *Greenock, Liverpool and London. Export Office: 74, Great Tower Street, London, E.C.*

Scotch and Irish whiskeys, bulk and case, Old Tom, unsweetened gin, rum.

See malt vinegar, GROUP XII.

GROUP XII.

MALT LIQUORS.

54 Allsopp & Sons, Limited, Samuel, *The Brewery, Burton-on-Trent.* [See Advt.]

Ales and stouts in cask; specialities in bottle (red hand brand), India pale ale, old English (strong) ale and extra stout.

55 Bingham-Cox & Co., *Kingsbury Brewery, St. Albans.*
Malt liquors.

56 Deasy & Co., *Clonakilty, Co. Cork.*

[See Advt.]

Stout and porter.

57 Foster & Sons, Limited, M. B., *27 Brook Street, Bond Street, London, W.* [See Advt.]

Bottled beers,

59 Murree Brewery Co., *Goragully, Rawal Pindi, Punjaub, East Indies; and Newara, Elyra, Ceylon.* London Agent: Percy T. Symes, 60 Ludgate Hill, E.C.
Bottled beer for hot climates.

60 O'Reilly & Co., M., 53-57 *Cork Street, Dublin.*

Irish pale malt for brewing stout, patent roasted crystal and amber malts, for colouring and flavouring stout and dark beers.

61 Page & Sons, J. R., *Westbury Brewery, Ashwell, Hertfordshire.*
Malt liquors.

62 Plunkett & Co., John, *Portland Works, Portland Street West, Dublin.*

Irish barley, pale malt (made from same), patent roasted malt, crystal and amber malts, for colouring and flavouring Dublin stouts and dark beers, also patent roasted maize for same purpose.

63 Porter & Co., Robert, 77 and 79, *Pancras Road, London, N.W.; and Wapping Goods Station, Liverpool.*

Bottled export ales and stout, "Bulldog" brand.

64 Tennent, J. and R., *Wellpark Brewery, Glasgow.*
Malt liquors.

Birmingham Vinegar Brewery Co., Limited. See GROUP XXIII.

Bowmore Distillery Co. See GROUP XI.

Crosse & Blackwell, Limited. See GROUP VI.

Maconochie Brothers. See GROUP VI.

Power & Co., Sir John. See GROUP XI.

GROUP XIII.

MACHINERY, PROCESS, AND APPLIANCES OF FERMENTING, DISTILLING, BOTTLING, AND STORING BEVERAGES.

See also exhibits in GROUPS LXIX and CXVI,

GROUP XIV.

FARMS AND FARM BUILDINGS.

65 Burdett-Coutts, W., M.P., 1 Stratton Street, London, W.

Model of the Brookfield stud farm, Highgate Road, London. The Brookfield stud, founded to preserve and develop the old English breeds of hackneys, coach-horses, Cleveland bays, cobs and ponies, comprises (1) the country farm in Hertfordshire, with 800 acres of grass, for breeding and rearing; (2) the London farm (here represented), including the show stables for pedigree stallions and mares, and the harness department for high-stepping horses ready for use. Typical portraits of some Brookfield stud horses, winners of championships, Queen's gold medals and premiums, first prizes, leading shows England and America. Hackneys:—"Candidate," champion '86, sire of "M.P.," champion '92, "Waldemar," "Nor' Eastern," "Beau Lyons," Beau Lyons' foal, "Goldwave," "Lady Alice," "Silvern Belle," "Lady Lyons" (dam of Matchless, Beau Lyons and Copenhagen, sire of Nitrate), "White Socks," "Dropping Well." Pony stallions:—"Tommy," "Lord Nimrod." Cleveland and coaching:—"Sultan," "Pari," his daughter. Thoroughbred hunter-stallions:—"Truefit." Harness:—"Fashion," "The Brown Team."

66 McDowall & Co., J., 230 Berkeley Street, Glasgow.

Horse and cattle condiments, calfmeal, hay and poultry spice.

Peat & Co., Henry. See GROUP LXXXIII.

GROUP XV.

LITERATURE AND STATISTICS OF AGRICULTURE.

67 British Government, BOARD OF AGRICULTURE, Whitehall, London, S.W.

Maps illustrating the relative extent of surface in Great Britain under permanent grass and arable culture, with the proportion of the cultivated area employed for wheat.

67a Gilbert, Dr. J. H., F.R.S., Rothamstead, St. Albans.

Results from the Rothamstead Experimental Farm.

68 Lawes, Sir John Bennett, Bart., F.R.S., Rothamstead, St. Albans.

Results from the Rothamstead Experimental Farm.

GROUP XVI.

FARMING TOOLS, IMPLEMENTS, AND MACHINERY.

Beckmann & Co. *See* GROUP XCV.

Belfast Ropework Co., Limited. *See* GROUP LXXXV.

Combe, Barbour, & Combe, Limited. *See* GROUP IX.

GROUP XVII.

MISCELLANEOUS ANIMAL PRODUCTS — FERTILIZERS AND FERTILIZING COMPOUNDS.

69 Anglo-Continental (late Ohlendorf's) Guano Works (The),
15 Leadenhall Street, London, E.C; and at Hamburg, Antwerp,
and Emmerich-on-Rhine.

Peruvian guano, phosphates, fertilizers, fertilizing compounds,
and raw fertilizing materials.

70 Croft & Co., Gonne, Calcutta, India.
Ground bone.

71 Drogheda Chemical Manure Co. (The), Drogheda, Ireland.
[*See* Advt.

Superphosphate, bone, corn and grass, root, pure dissolved
bones, and other manufactured manures; raw materials, phos-
phates, coprolites, sulphur ore, nitrate of soda, sulphate of
ammonia, potash salts, fish guano, dried blood, bones.

See also fertilizing substances, GROUP XLVIII.

Amines Syndicate, Limited, *See* GROUP CXLVII.

Doyle & Co., Harry. *See* Indian Exhibits.

Liebig's Extract of Meat Co., Limited. *See* GROUP VI.

Shaws, Limited. *See* GROUP LXXIII.

United Alkali Co., Limited. *See* GROUP LXXXVII.

GROUP XVIII.**FATS, OILS, SOAPS, CANDLES, &c.**

- 72 Ingham's Eucalyptus Oil Company, Rockhampton, and**
(distilleries) *Inghamstown and Wallaroo, Queensland.*

Twelve kinds of oil, manufactured from the various species of the Eucalyptus; Eucalyptus soap; Ingham's vegetable boiler fluid, for removing and preventing scales adhering to the heating surface of steam boilers.

- 73 Price's Patent Candle Co., Limited, Belmont Works, Battersea, London, S.W.** [Mfct. B.]

Candles, paraffin, stearine, glycerine, soaps, tapers, night lights; toilet soaps.

See also exhibits in GROUP LXXXVII.

GROUP XIX.**FORESTRY, FOREST PRODUCTS.**

The Exhibits in this Class are in the Forestry Building.

- 74 Bombay-Burmah Trading Corporation, Limited, Rangoon, Moulmein and Bankok** (care of *Wallace Brothers, 8 Austinfriars, London, E.C.*)

Teak timber squares and planks; teak railway wheel blocks and railway keys; sample of teak flooring and wood paving; cutch; samples of velvets, silks and cotton yarn dyed with cutch.

- 75 Indian Government, REVENUE AND AGRICULTURAL DEPARTMENT, Simla.**

Padouk wood from the Andaman Islands and other Indian forest products.

Arnold, P. & J. *See GROUP LXXXVIII.*

British North Borneo Co. *See GROUP VIII*

Ford, T. B. *See GROUP LXXXIX.*

Hodges, Edward. *See Indian Exhibits.*

Newball & Mason. *See GROUP LXXXVII.*

Quibell Brothers. *See GROUP LXXXVII.*

Ransom & Son, W. *See GROUP LXXXVII.*

Usher, Richard. *See GROUP LXXXVII.*

"OLD BUSHMILLS"



PURE MALT.



GAINED THE

ONLY GOLD MEDAL FOR WHISKEY

PARIS UNIVERSAL EXHIBITION, 1889,

AGAINST ALL COMPETITORS.

Bottled by the Distillers with their Branded Corks.

Every Bottle Bears their **TRADE MARK** on
Capsule and Label, and has **GUARANTEE** attached.

Distillery: **BUSHMILLS, CO. ANTRIM.**

Head Office: **BELFAST.**

London Office & Depot: **3-6, CAMOMILE ST., E.C.**

ESTABLISHED 1833.

THE STANDARD OF EXCELLENCE.

EXPRESSED OILS.

ALMOND (Ol. Amygd. Dule.)

PEACH KERNEL (Ol. Amygd. Persic. Dule.)
Frequently imported as "Ol. Amygd. Exot."

CROTON (Ol. Croton Tiglii.)

ESSENTIAL OILS.

ALMOND.

ANISEED.

BUCHU.

CARAWAY.

CARDAMOM.

CELERY.

CINNAMON.

CLOVE.

CORIANDER.

CUBEB.

CUMMIN.

DILL.

JUNIPER.

NUTMEG.

ORRIS ROOT.

PEACH KERNEL.

PEPPER.

PIMENTO.

SANDAL WOOD

and others.

WHOLESALE TRADE ONLY.

ALL KINDS OF DRUG AND SPICE GRINDING
 DONE FOR THE TRADE.

STAFFORD ALLEN & SONS,

7, COWPER STREET, LONDON, ENGLAND.

Department B.

HORTICULTURE.

BY W. THISELTON DYER, C.M.G., F.R.S.,

Director of the Royal Gardens, Kew.

Horticulture is an art which, it will perhaps be admitted generally, has attained, at the present moment, a higher level of excellence in the United Kingdom than in other countries. Its closest rivals at present are Belgium, and in many departments France and Germany. That it may be surpassed in the future by the United States is not improbable. But the measure of excellence, in a practical art, is the achievement of success in the face of difficulties. If the gardening of Scotland no longer enjoys its former deserved pre-eminence, it no doubt earned it, as has often been pointed out, by its intelligent struggle with the obstacles of an unpropitious climate. The more favoured countries, in which climate does most for the gardener, ordinarily find him little disposed to respond. Nature's facile profusion never incites him to cultural skill beyond the commonplace.

Several causes have co-operated to promote the gardening art in the United Kingdom. To slightly modify an often-quoted remark, if it has no climate it has many samples of one. Exposed on its western shores to the warm and humid influence of the Gulf Stream, on its eastern it comes in for a full share of the cold, drying winds of Central Europe. Its southern littoral, on the other hand, enjoys a free exposure to sunshine, which, in some degree, approximates to that enjoyed by neighbouring France. Every part of the British Isles has, therefore, its horticultural "character" and possibilities

of success. In the south of Ireland, the Cornish Peninsula, and in some degree, the west of Scotland, the pines of Mexico, the rhododendrons of the Himalayas, and the vegetation of New Zealand and temperate Australia, flourish with a vigour and luxuriance, which even the Italian lakes and the Mediterranean Riviera cannot surpass. In Southern and Central England, the elm, Oriental plane, beech, hornbeam, evergreen oak, Spanish chestnut, and a host of American species, are common trees, to be succeeded northwards by the sycamore and wych elm, and finally by the birch. The cloudy skies of the north of England favour the growth of the auricula, while in the cool summers of Southern Scotland, the sub-alpine vegetation of New Zealand and the Himalayas find a congenial resting-place. In the moist valleys of Central Scotland, the pines of the Rocky Mountains and of California bid fair to rival their ancestors in their native homes.

The country districts of the British Isles have for many centuries been the home of a leisured and well-to-do gentry. As early as the fifteenth century every country-house had its garden, in which were grown a profusion of salad-herbs, and such approved simples as were needed for domestic use or administration by the local Lady Bountiful to the neighbouring villagers. The "still-room" was a necessary feature in every large house, for drying herbs and preparing from them infusions and extracts. It still often survives, with its attendant maid, whose duties are, however, usually confined to the preparation of "afternoon tea." The sovereign and great nobles had a more ambitious "physic garden," under the charge of a resident physician.

In the sixteenth century gardens became a more definite adjunct to the amenity of the residences. They were usually extremely formal, surrounded by clipped hedges, to afford shelter for exercise in inclement weather. The cultivation of simples laid the foundation for the "*parterre*," in which herbaceous plants were grown, though still in a severely formal manner, but rather for their decorative effect than for their medicinal uses. The introduction of many familiar garden plants from the East stimulated in great measure the taste for purely decorative gardening. The gardens

attached to the houses of some of the great nobles were extremely elaborate and extensive. Alleys and hedge-surrounded compartments were their prominent features, and there was no division, as in modern gardens, between the part which was purely decorative and what was utilitarian.

The seventeenth century saw the introduction of the more grandiose, but still formal continental style, one of the first examples of which was the laying out of St. James' Park by Le Notre. In the eighteenth century, Bridgeman broke entirely away from ancient traditions, and invented the naturalistic treatment, which is still characteristic of English landscape gardening. One of his earliest works was the laying out of Richmond Gardens, now part of Kew. By the introduction of the sunk fence, or "Ha, Ha," he was able to dispense with boundary walls, and to obtain novel effects of distance.

The latter part of the present century saw a curious return to formal gardening. Herbaceous plants, in which the horticulture of the United Kingdom had been so rich, were neglected, or banished to find a refuge in the gardens of cottagers, from which of late years they have been in great measure recovered. In their place so-called "bedding-plants" were grown in formal masses, with no other aim than to produce a chromatic effect. This was to some extent a return, but in modern guise, to the system of the "*parterre*." The fault of the system was its unvarying monotony and often harshness of effect, and the consequent lack of interest to the cultivator. Of late years, the cultivation of herbaceous plants, in carefully arranged borders, has been resumed with enthusiasm. This brings the flowers into touch with the other elements of an English landscape-garden. The constant succession from spring to autumn, and the various attractions of each successive group, makes a well-stocked and properly cared-for garden a never-ending source of pleasure to its possessor.

The first greenhouses in England were simply winter shelters for oranges, bays, and myrtles, grown in tubs, and stood out of doors in summer as ornaments to the formal garden. They were solidly roofed, and had merely windows in front. Perhaps the

earliest greenhouse, of a modern type, was that designed for the Princess Dowager of Wales at Kew in 1758 by Dr. Hales, and erected by Sir William Chambers. It was warmed by heated air from furnaces, led through a complicated system of flues. Hot-houses of this type were cumbrous structures, built of wood with small panes of glass. In the present century copper was often used for greenhouses, and it was possible to erect structures with a more slender framework, and admitting light much more freely. But the architectural features of the old orangery were still too often preserved, and side light was cut off by solid walls. The present tendency is to build plant houses with little regard to any consideration but the requirements of the plants grown in them. The use of iron gives lightness of construction and durability. The tendency is to study the needs of plants more carefully in detail, and wherever the cultivation of a large and varied collection is attempted, to have a multiplicity of small houses, rather than to mass the collection in a few large ones. These houses, in a well-devised range (such as that of the University of Cambridge or of the Right Hon. Joseph Chamberlain), stand side by side, running north and south, and are connected and approached by a glazed corridor, out of which the necessary work-sheds also open. The heating is almost invariably effected by hot-water. This is supplied by powerful tubular boilers, heated with coke or anthracite. The principle aimed at is to heat rapidly small quantities of water, and thus keep a relatively large body in constant circulation. Little difficulty is experienced in distributing the heat over considerable distances; the flow is empirically regulated by valves, and the different temperatures required are obtained by increasing the pipe-surface. The great difficulty of cultivation under glass is winter management. The warm air, on coming in contact with the glass is rapidly cooled, deposits its moisture which produces "drip," and descends upon the plants in chilling streams. This may be remedied by the use of blinds at night to check radiation, and by the employment, which is now becoming frequent, of accessory hot-water pipes above the level of the plants.

The close study which the cultivation of plants under glass is

present receiving in the United Kingdom has led to more attention being paid to "ventilation." The access of fresh air is no longer regarded as a mere means of controlling the temperature and humidity. It is best admitted below the stages by openings closed with a shutter; the air is sufficiently warmed by passing over the hot-water pipes. Its exit above is best provided for on the "lantern system," which permits ventilation to the leeward, and so protects the plants from rain and the direct impact of drying winds.

The chief features of horticultural practice under glass can only be briefly treated of. Perhaps the most widely diffused is that of the vine, which dates from the middle of the last century. The production of grapes without its aid is at best uncertain and the crop mediocre in quality. With it, it is a necessary appanage of the most moderate garden. It is, however, singular, that the finest results are obtained in the cooler climate of the north of England and Scotland. Its most interesting development in recent years is the production of grapes for market purposes. Originally, perhaps, initiated in the Channel Islands, it is now an important industry in the neighbourhood of London and other large towns. Acres of ground are roofed in with iron and glass houses of the simplest construction and warmed with hot water. The existence of these houses has suggested their use for the production of many market products, such as tomatoes, which ripen precariously in the open air.

The methods of vine-culture in private establishments have also been extended; and the wealthy are able to enjoy, early in the season, peaches and other fruits, which, though succeeding well with wall-treatment, are subject to climatic vicissitudes. Orchard-house culture has a peculiar charm. The crop of table-fruit can be produced with absolute precision, and the beauty of well-cultivated trees redeems the purely utilitarian purpose in view. The further development of this kind of horticulture is, however, perhaps doubtful. If Canning contemplated bringing the New World to redress the balance of the Old, commerce has enabled the Southern Hemisphere to supply the wants of the Northern. The Colonial and Indian Exhibition in London suggested the possibility of a

Colonial fruit trade. Already pears and apples from Tasmania, and peaches and grapes from South Africa reach the market, far in advance of any that can be produced in English gardens under glass. The culture of the pine-apple, once one of the glories of English horticulture, has been all but extinguished by the fine fruit imported from the Canaries and West Indies.

Open air fruit-culture in England can only be touched on. The area suitable, mostly in the south-east of England, is limited. The produce is rarely cheap, except in years when an exceptional season produces an unusual crop, and therefore a market-glut. Yet the quality is mostly excellent; and if the apples of the United States and Canada are more attractive in appearance, they lack, for the most part, the qualities of flavour which characterise those of Kent. In the west of England apples and pears are largely grown, mostly on old-fashioned lines, for the manufacture of perry and cider, while in Western Central England there is an important plum-culture. The profitable conversion of the crop into dried plums, after the fashion of the south of France and California, appears little likely to be practicable for want of the necessary sun-exposure.

The decay of English agriculture has given, indirectly, an immense impulse to market-gardening. This would, doubtless, be still further sustained by the increasing luxury of the middle class if facilities of railway transport and market distribution were not, to a great extent, behind the times. The traditional culture of vegetables has always been excellent in Great Britain, and it has, of late years, been vastly improved by an intelligent study of French methods. But the extension of a "*petite culture*" in England must wait on events; and the manufacture of "jam" recommended by the prime minister has scarcely as yet proved even a palliative for the distress of the cultivator.

The wider diffusion of accumulated wealth has, however, developed an interesting and apparently profitable industry in the cultivation of flowers for the market. Their use for purposes of hospitality, for church decoration, and for funerals, has created a demand, which supports a considerable industry carried on with

the highest degree of cultured skill. Few persons, probably, realize the technical dexterity required to turn out market products at the right moment, and with almost mechanical uniformity.

The market-gardening business is dependent on that of the seed merchants, and this, in turn, has of late taken a striking development. It is one which requires a large capital and a skilled staff. The large firms have numerous carefully chosen seed-grounds, widely separated, so as to preclude the plants being mongrelised, and to keep their strains true. The crops are most rigidly "rogued" of all plants which depart from the type. The pains expended are amply rewarded by the reputation for "trueness," which good seeds enjoy. Flower seeds were formerly largely imported from the Continent, but are now grown on a vast scale in the United Kingdom.

The occupations of the English people take them in large numbers early in life to every part of the habitable globe. Many return in later years to end their days in competence in the mother country. In some shape or other they all foster gardening. The race has an affection for plants. Some pathetic attempt at cultivation may be seen in the most sordid slums of the great cities; and the hawking of flowers amongst the poor is, perhaps, not less profitable on the whole, than their more costly sale to the rich. But the ubiquitousness of the English race, and its far-reaching commerce, brings to the United Kingdom a wide knowledge of plants. Probably, more exotics are grown in it than in any other part of the world's surface. Innumerable well-to-do people maintain some sort of private collection. The business of the plant merchants who supply these is carried on in many cases on a prodigious scale. Their travellers ransack the world for novelties, and their stock, under glass, covers ground which can only be measured by acres. At the moment, the culture of orchids is the most popular; it has proceeded, of late years, by leaps and bounds. At first misunderstood, it was supposed to involve great difficulty and require a high temperature. But the cultivation of the cool species presents but little difficulty, and is within the reach of the most moderate means.

Other amateurs devote themselves to a speciality, such as the cultivation of the rose, the chrysanthemum, the carnation, the auricula, or the dahlia. Each has its own devotees, its own special societies, its own shows.

To sum up :—in no country is horticulture the source of so much popular interest, of so much sober recreation, and of so much industrial activity, as in the United Kingdom.

[DEPARTMENT B.

HORTICULTURE, VITICULTURE, POMOLOGY, FLORICULTURE, &c.

Unless otherwise stated, the Exhibits in this Department are in the Horticultural Building.

GROUP XX.

VITICULTURE, MANUFACTURED PRODUCTS, METHODS AND APPLIANCES.

- 76 Clarke, Joseph, *Albion Nursery, Hale Road, Farnham, Surrey.*
Grapes—collection of varieties grown without artificial heat.

GROUP XXI.

POMOLOGY, MANUFACTURED PRODUCTS, METHODS AND APPLIANCES.

- 77 Beach & Sons, Limited, T. W., *Ealing Road, Brentford, London, W.; and The Rt. Hon. Lord Sudeley's Fruit Plantations, Winchcombe, Cheltenham.* [Agric. B.]
Whole fruit jams, bottled fruits (preserved in water), fruit jellies.
- 78 Chambers, Charles, *Kent Preserving Works, Maidstone, Kent; and London.* [Agric. B.]
Preserved fruits in bottles, spice, jam and other forms; fruit jellies, marmalades.
- 79 McIndoe, J. (Gardener to Sir Joseph W. Pease, Bart., M.P.), *The Gardens, Hutton Hall, Guisborough, Yorkshire.*
Collection of English grown fruit.
- 80 Riddle & Co., Alexander, 36 & 38 *Commercial Street, London, E.* [Agric. B.]
"Stowers'" lime juice cordial, "Stowers'" lime juice, both free from spirit.

- 81 **Rose & Co., Lauchlan, Leith, Scotland; and 11 Curtain Road, Finsbury, London, E.C.** [Agric. B.]

Lime juice cordial, prepared lime juice, and lime juice beverages in general.

See malt vinegar, GROUP XII.

Belfast Mineral Water Co. See GROUP X.

Birmingham Vinegar Brewery Co., Limited. See GROUP XXIII.

Cory & Co., William. See GROUP X.

Crosse & Blackwell, Limited. See GROUP VI.

Harry & Co. See GROUP XXIII.

Idris & Co. See GROUP X.

Maconochie Brothers. See GROUP VI.

Ransom & Son, W. See GROUP LXXXVII.

Ross & Sons, Limited, W. A. See GROUP X.

Shanks & Co., J. See GROUP X.

Stevenson & Howell. See GROUP LXXXVII.

GROUP XXIII.

CULINARY VEGETABLES.

- 82 **Birmingham Vinegar Brewery Co., Limited (The), Ashted Row, Birmingham.** [Agric. B.]

Holbrook's Worcestershire sauce specially prepared and bottled in England for the American market, pickles, vinegar, essence of anchovies, ketchup, capers, olives, curry powder, cayenne, table salt; baking, custard, egg and blancmange powders; flavouring essences.

- 83 **Edmunds, Joseph, "The Empress" Indian Condiment Warehouse, Belper Street, Barnsbury, London, N.** [Agric. B.]

"The Empress" curry powder, curry paste, mulligatawny paste, curry sauce, chutney, chutney sauce, the "Favorite" chutney, Edmunds' gorgona anchovies, essence of anchovies, anchovy paste, bloater paste; flavouring essences, cochineal and prepared ditto; vanilla pods, seeds used in the manufacture of curry powder.

- 84 **Harry & Co., The Indian Condiment Factory, 4 College Square, Calcutta, India.** [Agric. B.]

Chutneys, pickles, curry paste, curry powders; preserves, jam, jelly, guava cheese.

- 85 Keen, Robinson, & Belleville, *Garlick Hill, Cannon Street, London, E.C.*** [Agric. B.]

Keen's mustard; Robinson's patent groats and patent barley for foods for invalids.

- 86 Nowrojee Framjee, *9 Forbes Street, Fort, Bombay, India.***

Indian condiments. [Agric. B.]

Crosse & Blackwell, Limited. See GROUP VI.

King & Co., Limited, Frederick. See GROUP VI.

Maconochie Brothers. See GROUP VI.

GROUP XXIV.

SEED RAISING, TESTING AND DISTRIBUTION.

- 88A Bull, Wm., *536 King's Road, Chelsea, London, S.W.***

Chinese primulas, cinerarias, calceolarias, mignonette, and fifty coloured illustrations of new plants and flowers.

- 88B Cannel & Son, *Swanley, Kent.***

Primulas, phloxes, pæonias, pansies, roses, begonias, cyclamen, cinerarias, calceolarias.

- 88C Carter & Co., J., *237 & 238 High Holborn, London, E.C.***

Seeds.

- 88D Kelway & Son, *Langport, Somerset.***

Primulas and other plants.

- 88E Laing & Sons, J., *Forest Hill, London, S.E.***

Cinerarias, primulas, cyclamen, pansies.

- 88F Waterer, Anthony, *Knap Hill Nursery, Woking, Surrey.***

Rhododendrons, azaleas, conifers.

Edmunds, Joseph. See GROUP XXIII.

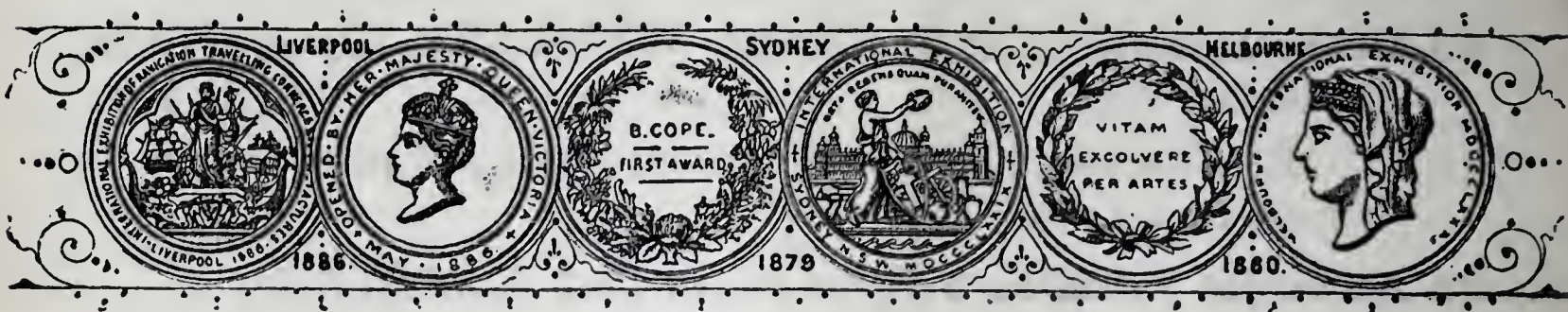
GROUP XXVI.

APPLIANCES, METHODS, &C.

- 87 Main, Thomas, *Milton Bowling, Dumbartonshire, Scotland.***

[Grounds.]

Portable reversible horticultural glass buildings, glazing without putty for all kinds of glass building, roof lights, ventilators and window sashes; portable independent combination hot-water boiler for heating all kinds of buildings.



ESTAB. 1810. **BENJ^N COPE & SONS, L^{td}.** TRADE MARK. **B.C.**

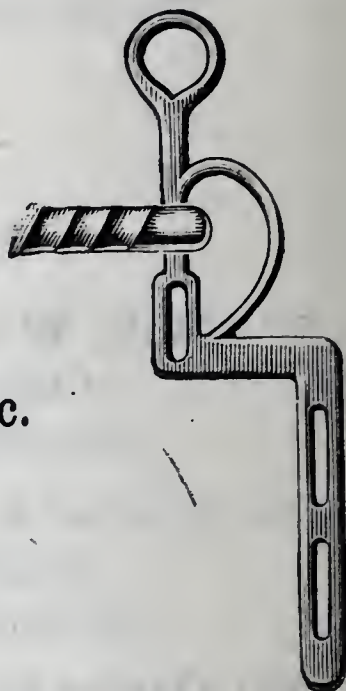
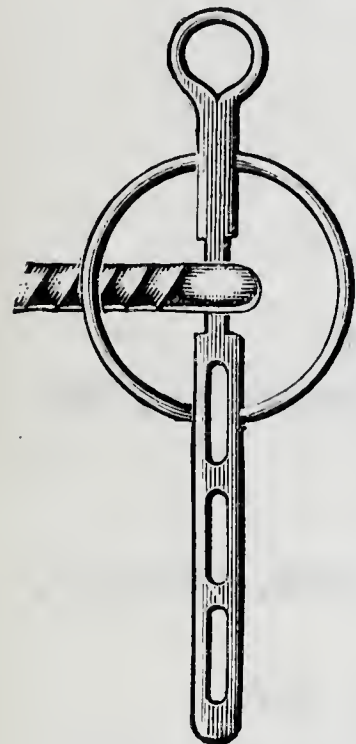
Wholesale Manufacturers

Of all kinds and qualities of

**BRIDLE BITS, PELHAMS,
SNAFFLES, BRADOONS,
CURBS, CHAINS, SPRING HOOKS, &c.**

FOR

Riding, Driving, Racing, Trotting,
Polo, Exercising, Breaking,
Military and other Purposes.



MANUFACTURERS OF EVERY DESCRIPTION OF

STIRRUP IRONS

For Riding, Racing, Steeplechasing, &c.

Patentees and Sole Manufacturers of

THE BEST AND SIMPLEST

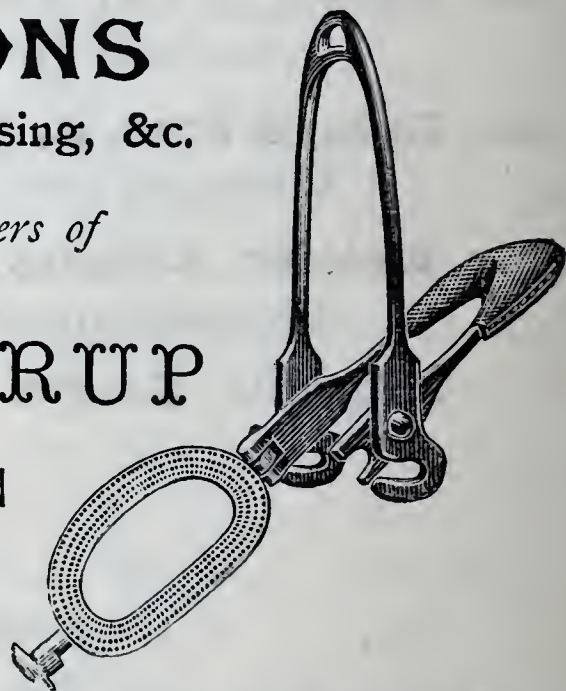
SAFETY STIRRUP

FOR

LADIES, GENTLEMEN, AND CHILDREN

English Patent No. 8940, July 24, 1885;

American Patent, No. 341,987, May 18, 1886.



ALSO,

BRIDLE CUTTERS IN ALL BRANCHES,

PURSE MAKERS AND GENERAL FANCY LEATHER WORKERS, &c.

(Bits, Stirrups, &c., in Solid Nickel and other Metals, Warranted not to Rust.)

BLOXWICH, near WALSALL, ENGLAND.

Department C.

LIVE STOCK, DOMESTIC AND WILD ANIMALS.

BY ERNEST CLARKE.

In the department of live stock the question naturally arises, To what do the British breeds of live stock owe their excellence and universal acceptance? The answer is, firstly, that the variable climate and diversified soil of Great Britain are well adapted to the production of hardy and useful animals; and secondly, that the latter have been brought to a high state of perfection through an intelligent application of correct principles of selection and breeding continued over a long course of years.

The HORSES of Great Britain comprise the English Thoroughbred, the Hackney, Pony, Coaching, and Cleveland amongst the *light* breeds, and the Shire, Clydesdale, and Suffolk amongst the *heavy* breeds. The *English Thoroughbred*, so famous for high mettle, speed, and endurance, is bred principally for the racecourse, whilst his progeny out of suitable half-bred mares make capital hunters, and are useful for military purposes. Good English Thoroughbred sires have been largely used by European Governments for the improvement of their military studs. *Hackneys* are bred for riding and driving purposes, special attention being paid to "action." They are principally reared in the counties of Norfolk, Cambridge, Huntingdon, Lincoln, and York. The *Coaching* and *Cleveland Bay* breeds belong to Yorkshire, and are nearly identical, though their distinctive features have lately received official recognition by the provision of separate classes for each in the shows of the Royal Agricultural Society. They are bred for the plough, for slow riding, and for big carriage horses. *Ponies*, by which are meant all horses under fourteen hands high, include every variety of size down to $8\frac{1}{2}$ or nine hands. Their breeds comprise the English, Dartmoor, Exmoor, New Forest, Welsh, Shetland, and Highland, which names sufficiently indicate their native localities. They are used for a

variety of purposes, such as riding cobs, small carriage ponies, mountain-climbing, and pit work in the collieries and mining districts.

Of the heavy breeds the *Shire* is the largest. He combines immense size and weight with great intelligence and docility. Originally descended from the old English war horse, he is now employed for dragging the heaviest loads, such as steam-engines, thrashing machines and brewers' drays, as well as for ploughing heavy land. He is bred chiefly in the Midland counties. The *Clydesdale* is a somewhat similar type of horse, not quite so large as the *Shire*, but with quicker action. As the name implies, the home of the horse is in Scotland, though he is also bred in parts of England. Altogether distinct from the two preceding breeds is the *Suffolk*, or *Suffolk Punch*, which is largely bred in the county whence it takes its name. The animal makes an admirable plough and cart horse. Its legs are without the hair, or "feather," which is characteristic of the *Shire* and *Clydesdale*.

The number of agricultural horses in Great Britain in the year 1892 (exclusive of horses kept for pleasure, trade, or transit) was officially returned by the Board of Agriculture as follows:—Used solely for agriculture, 1,026,971; unbroken horses, 424,237; mares kept solely for breeding, 66,874; total for Great Britain, 1,518,082. The total in the United Kingdom at the same period was 2,067,549.

The CATTLE of Great Britain comprise, as beef-breeds, the *Short-horn*, *Hereford*, *Devon*, *Sussex*, *Welsh*, *Aberdeen-Angus*, *Galloway* and *Highland*; and, as dairy cattle, the *Shorthorn*, *South Devon*, *Longhorn*, *Red-Polled*, *Ayrshire*, *Jersey*, *Guernsey*, *Kerry*, and *Dexter Kerry*. The *Shorthorn* for its general utility, both as a beef and a milk producer, stands pre-eminent. Originally bred on the banks of the River *Tees*, which divides *Durham* from *Yorkshire*, it has—under the name of the *Durham*—become practically ubiquitous, one of its chief characteristics being its easy adaptability to every variety of climate and soil. The prevailing colour is either red, or white, or roan, or a mixture of these. *Hereford* cattle are bred in *Herefordshire* and adjoining counties. Docile, and easily fattened, they are invaluable for grazing. In colour they are red, with white breast and abdomen, white faces, and white mane. *Devons* belong to *Devon* and *Somerset*. They are active animals, of medium size, symmetri-

cally built, and as beef-producers turn to the best account the poor pasturage of their native uplands. In colour they are of various shades of whole red. Somewhat similar to this breed, but a little larger and more of a chestnut brown, are the *Sussex* cattle, bred in the county from which they are named. The *Welsh* cattle are huge, heavy beasts, comprising several varieties. They are black, with long horns, and are largely imported into the midland counties to be grazed for the butcher. The race of *Longhorn* cattle, once the most famous of English breeds, is almost extinct, only a few now being bred, chiefly in Warwickshire. The *Aberdeen-Angus* and *Galloway* are two hornless breeds belonging to Scotland, the former to Aberdeenshire, the latter to Galloway and the district in the south-west of Scotland. Both are excellent beef-makers, though the Galloways do not mature so rapidly as the Aberdeen-Angus. Their prevailing colour is black. The *Highland* breed, with horns, whose home is in the Highlands and Western Isles of Scotland, possesses a shaggy picturesqueness of appearance well suited to the romantic scenery of its native haunts. Though these animals do not mature early, yet their beef, when ripe, is of excellent quality. The colour ranges from light dun or tawny yellow to black. Of the dairy breeds, the *Red Polled*—hornless, as its name implies—is a native of East Anglia, being bred chiefly in Norfolk and Suffolk. Its milking qualities are remarkable mainly on account of the length of time during which the cows continue in milk. It is also valuable as a beef-maker. The *South Devons* or *Hams* are a local breed peculiar to South Devonshire. The cows give abundance of milk, yielding superior butter. The group of Channel Islands lying off the coast of France, but belonging to the English Crown, are justly celebrated for their dairy herds. The beautiful *Jersey* cattle have long been carefully bred, the aim being to reduce size and increase the yield of milk. The milk, besides being remarkably abundant, is so rich in fat that the butter yielded is of the finest quality. The colours predominant in the breed are light silver grey, brown, and fawn. The *Guernsey* cattle, whilst possessing in the main the same qualities, are larger than the Jersey, and have not their elegant and compact appearance. Their colour is of a rich yellowish brown, with white markings. With the object of keeping the breeds pure and free from disease, the strictest prohibitions against the importation

of other cattle are maintained in both Jersey and Guernsey. Both breeds have come very prominently into favour of late years, and many herds are kept in the more southern counties of England. The *Ayrshire* cattle are the dairy breed of Scotland, and are largely used in other counties besides the one whose name they bear. The milk is especially valuable for cheese-making. They are small, and in colour usually white and brown. The *Kerry* and *Dexter Kerry* are the Irish national breeds. Both produce excellent milk. The animals are small, the Dexters being the smaller of the two. In colour, the Kerries are generally black, and the Dexter Kerries, either black or red.

The number of Cattle in the United Kingdom, including the Isle of Man and the Channel Islands, as returned for the year 1892, was as follows:—Cows and heifers in milk or in calf, 4,120,451; other cattle, two years and above, 2,719,615; under two years, 4,679,351; total, 11,519,417.

The breeds of British SHEEP are generally remarkable for their large size and weight of carcass, as well as for their prolific yield of fine wool. They are divisible into Longwools, Shortwools, and Mountain sheep. The *Longwools* include the Leicester, Border Leicester, Cotswold, Lincoln, Kentish, Devon Longwool, South Devon, Wensleydale, and Roscommon. The *Shortwools* comprise the Oxford Down, Southdown, Shropshire, Hampshire Down, Suffolk, Ryeland, Somerset and Dorset Horned, and the Clun Forest. The *Mountain* breeds are the Cheviot, Black-faced Mountain, Herdwick, Lonk, Exmoor, Welsh Mountain, and Limestone. The *Leicester*, originally improved by Robert Bakewell of Dishley, is kept pure in Leicestershire and adjoining counties, but it is principally used for crossing with other breeds, to which it imparts early maturity and fattening qualities. The *Border Leicesters* are descended from a branch of the original Leicesters. They are cultivated upon the Scotch Borders, whence they take their name. The *Cotswolds* are big sheep, originating in the Gloucestershire Hills. Though not yielding mutton of particularly fine quality, they are useful for crossing, as they impart size. *Lincoln* sheep are descended from the old native Lincolnshire breed, improved by crossing with the Leicesters. It is a hardy, prolific breed. Its wool is dense, long, and of good staple. The *Oxford Down* is the result of a cross between the long-woolled

Cotswold and the short-woolled Hampshire or Southdown. The home of the *Southdown* is upon the Sussex hills known as the South Downs. This sheep has been largely instrumental in the improvement of the short-woolled breeds, as the Leicester has been in the improvement of the long-wools. The *Shropshire* breed, which has lately come into favour, has much similarity to the Southdown, by which it has been improved. It yields, however, a larger fleece and a heavier carcass. The *Suffolk* is a modern breed descended from the old Norfolk ewes by the use of Southdown rams. The *Cheviot* is a hardy horned sheep flourishing upon the hills which divide England from Scotland, and the still harder horned *Black-faced Mountain* is in much request upon the exposed uplands of North Britain. The remaining breeds are more strictly local, and it will suffice to indicate the localities from which they come. *Herdwicks* thrive upon the mountains and fells of Cumberland and Westmoreland. The *Ryeland* takes its name from Ryelands, a poor hilly district of Herefordshire. The *Devon Longwool* is an improved breed of Devonshire, and West Somerset, with a considerable amount of Leicester blood. The *South Devons* or *Hams*, like the cattle, are restricted to the part of the country from which they are named. The *Somerset and Dorset Horned* is an old West Country breed, very hardy and prolific. The *Lonk* is the largest of the mountain breeds, and has its home amongst the hills of Lancashire and North Yorkshire. The short-woolled *Exmoor* and the long-woolled *Dartmoor* come from the moorlands of Devonshire. The former make excellent mutton. The name of the *Welsh Mountain* breed indicates its home. The *Limestone* breed belongs to the fells of Westmoreland, the *Wensleydale* to a district of Yorkshire, and the *Clun Forest* to West Shropshire and adjacent parts of Wales. The *Roscommon* is the native breed of Ireland, largely improved by Leicester blood.

Generally it may be said that, whilst the mutton of the large jointed Leicester is by no means inferior, that of the Down breeds is in greater request for the London markets, whilst the small-jointed Welsh mutton is particularly choice and sweet.

The number of Sheep officially returned for the United Kingdom in 1892 is as follows: One year old and above, 20,881,837; under one year old, 12,760,971; total, 33,642,808.

The British breeds of Pigs are the Large White, the Middle White,

the Small White, the Small Black (Suffolk or Essex), the Berkshire, and the Tamworth, though it should be stated that the classification of pigs in England is not so well defined as in the case of other descriptions of live stock. The white breeds were formerly called "Yorkshires." In colour the Berkshires are black, with white feet and spotted face, and the Tamworths are red. The Large Whites may be fattened to an enormous size, the Middle Whites make excellent porkers. The Small Black is noted for its early maturity. The Tamworth is one of the oldest of the pig breeds. Originally from the district around Tamworth—a Staffordshire town—it is now extensively bred as a good bacon pig. The number of pigs in the United Kingdom, as returned for the year 1892, was 3,265,898.

With regard to cattle, sheep, and pigs, great success has attended the efforts of breeders during the present century to induce "early maturity," whereby meat is ripened for the butcher at a much earlier age than is normally the case, thus effecting considerable economies by the saving of time and the diminished total consumption of food-stuffs.

DEPARTMENT C.

LIVE STOCK, DOMESTIC AND WILD ANIMALS.

*The Exhibits in this Department are in the Live Stock Pavilion.
For the Live Stock Exhibits see the General Official Catalogue.*

GROUP XXXII.

DOGS.

Peat & Co., Henry. *See* GROUP LXXXIII.

GROUP XXXIV.

POULTRY AND BIRDS.

88 Mann & Norman, *Bellevue Poultry Farms, Bedford.*
Incubators and foster mothers.

89 Westmeria Company (The), *Leighton Buzzard, Buckinghamshire.*
Incubators (one 100, the other 50 egg capacity) for all varieties of poultry and game, a brooder or foster mother, an after brooder.

GROUP XXXV.

INSECTS AND INSECT PRODUCTS.

See sheep dips, GROUP LXXXVII.

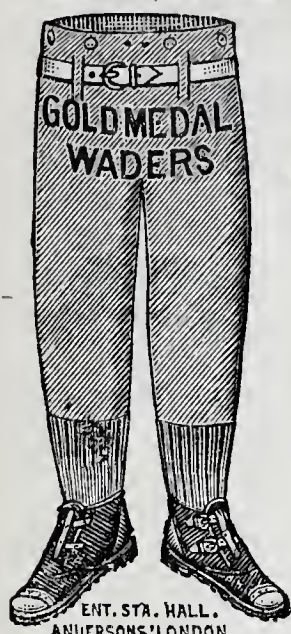
Edmunds, Joseph. *See* GROUP XXIII.

SEE EXHIBITS, NOS. 95 IN FISHERIES, 451 IN MANUFACTURES.

ANDERSONS'

GOLD MEDAL AND SPECIAL PRIZE

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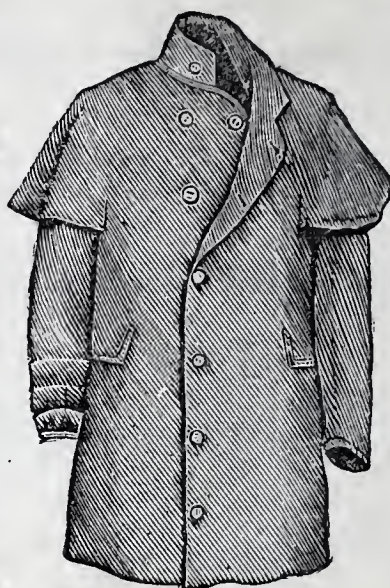


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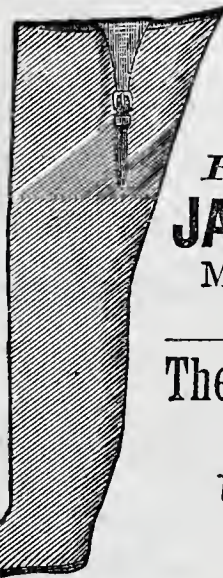
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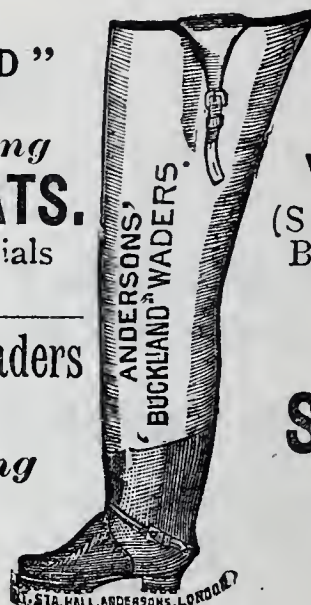
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Medal qualities.



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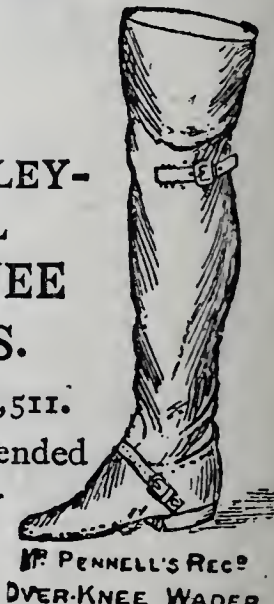
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WORKS—BOW, LONDON, E.

SEE INSIDE FRONT COVER AND PAGE 395 FOR FURTHER ADVTs.

Department D.

FISH, FISHERIES, FISH PRODUCTS, AND APPARATUS OF FISHING.

SEA FISHERIES.

BY E. RAY LANKESTER, M.A., LL.D., F.R.S.

Linacre Professor of Comparative Anatomy in the University of Oxford.

It would be an interesting and valuable contribution to the study of progress in the arts of civilization, were it possible to produce a report showing the influence of increased study and knowledge of the life and habits of sea fishes upon the success of the great industry of Sea Fisheries. Unfortunately, the production of such a report in reference to the Sea Fisheries of the United Kingdom is impossible, because ten years have not elapsed since systematic efforts to acquire thorough—that is, scientific—knowledge as to sea fishes were initiated in these islands; whilst seven years only have passed since authoritative statistics were published by a Government Department—the Board of Trade—setting forth the quantity and value of the sea fish landed at British ports. Previously to this date, statistics had been published by the same authority as to the fish conveyed by railway.

The newer statistics have clearly greater value from some points of view than the older statements relating to railway traffic only, but from the point of view of the student of British fisheries are almost worthless, since, whilst we are informed as to the weight and value of fish landed, we are not supplied with information on two heads of absolutely essential importance, viz. (*a*) the fishing-grounds on which the fish were taken; (*b*) the local habitation of the crew and boats through which the fish were landed. Thus it is possible that, though the fish landed may have increased or diminished in value, the fish may have been brought from the banks of Iceland or from the Bay of Biscay, and so the figures furnish no data for conclusions as to fishing-grounds nearer the British coasts. And moreover, the crews and boats

employed may have been of foreign origin, or at any rate will certainly not necessarily be English rather than Irish or Scotch, though landing fish in an English port. Until those who are responsible for the production of these statistics devise means for discriminating the origin of the fish landed, and also the origin of the crews landing them, they will be of small value to the economist or naturalist. The relatively very small value of the fish landed in Ireland does not necessarily imply that the Irish fisheries are not highly productive, or that Irish fishermen are not numerous and prosperous. The fact is that a very large proportion of the produce of Irish fisheries is landed in Scotland and in Wales (Milford), and that not only by Scotch and Welsh fishermen, but by crews of Irish domicile. The same fundamental fallacy underlies all conclusions as to the condition of fishing grounds and the relative prosperity of the fishermen of England and Scotland which might appear at first sight to be warranted by the figures quoted below.

Nevertheless, as giving some idea of the magnitude of the interests involved, I may quote some of the figures furnished by the Board of Trade.

Up till the year 1886 the only statistics concerning fisheries of the United Kingdom published by the Board of Trade were those of fish conveyed by railway, published in an annual "Return." Since 1887 the total quantity of fish landed and various detailed statistics have been added.*

In this Return statistics for Scotland and Ireland, as well as for England and Wales, are included; but they are received from the Scottish Board and Irish Inspectors respectively, not, as in England and Wales, collected by the Board of Trade itself. The Return is quite separate and distinct from the Annual Report of the Inspector of Sea Fisheries, and from the Annual Report on Salmon and Fresh Water Fisheries.

A statement regarding the number of fishing boats and fishermen has been published for many years in the Annual Statement of Navigation; it is not included in the Return of Fisheries Statistics, except in that of 1887, where a summary was given.

* Statistical Tables and Memorandum relating to the Sea Fisheries of the United Kingdom, including Return of the Quantity of Fish conveyed Inland by Railway from each of the Principal Ports of England and Wales, Scotland and Ireland during each of the years—and—inclusive.

The total quantities and value of fish landed in 1886 are thus given in the first Return:—

	Quantity. Tons.	Value £
England and Wales	320,000	3,957,000
Scotland (excluding salmon) .	236,000	1,476,000
Ireland (estimated)	24,000	643,000
	<hr/> 580,000	<hr/> 6,076,000

At the same time the following figures were given as showing the Annual Value of Sea Fisheries of foreign countries.

	£
Norway	1,066,000
France	3,518,000
Canadian Dominion	3,692,000

It was found to be impossible to get complete totals for the United States. As to the method of collecting the statistics in England and Wales, the particulars are generally obtained through the Coastguard officers employed at the different stations on the coast, except in the case of the more important stations, where special officers have been appointed. The returns from these officers are received at the Board of Trade once a month, and the abstract results are published monthly.

The last Annual Return is that of 1892, referring to 1891. In that year the totals were—

	Tons.	£
England and Wales (excluding Shell-fish)	298,000	4,491,000
„ „ Shell-fish		380,000
		<hr/> 4,871,000
Scotland (excluding Shell-fish)	264,200	1,754,000
„ Shell-fish		76,000
		<hr/> 1,830,000
Ireland (excluding Shell-fish)	30,550	296,000
„ Shell-fish		12,000
		<hr/> 308,000
United Kingdom (excluding Shell-fish) .	592,750	6,541,000
„ Shell-fish		468,000
		<hr/> 7,009,000

In this last Return the totals for the whole series of years for which the statistics have been collected are placed in tabular form for the sake of comparison, as follows:—

STATEMENT OF THE TOTAL QUANTITIES AND VALUES OF FISH LANDED FOR EACH YEAR SINCE THE COLLECTION OF STATISTICS COMMENCED.

	QUANTITY (excluding Shell Fish).			
	England and Wales.	Scotland.	Ireland.	Total United Kingdom.
	Cwts.	Cwts.	Cwts.	Cwts.
1886	6,412,433	4,718,145	No return.	—
1887	6,029,481	5,043,529	" "	—
1888	6,348,072	4,756,936	402,245	11,507,253
1889	6,464,564	5,416,012	801,654	12,682,230
1890	6,100,630	5,362,115	798,631	12,261,376
1891	5,966,076	5,283,764	611,078	11,860,918

	VALUE (excluding Shell Fish).			
	England and Wales.	Scotland.	Ireland.	Total United Kingdom.
	£	£	£	£
1886	3,688,079	1,403,391	No return.	—
1887	3,778,958	1,330,394	" "	—
1888	3,948,013	1,339,577	183,528	5,471,118
1889	3,862,389	1,430,631	317,931	5,610,951
1890	4,368,552	1,659,612	362,804	6,290,968
1891	4,491,018	1,753,987	295,643	6,540,648

	TOTAL VALUE (including Shell Fish).			
	England and Wales.	Scotland.	Ireland.	Total United Kingdom.
	£	£	£	£
1886	3,957,075	1,476,259	No return.	—
1887	4,103,459	1,396,963	" "	—
1888	4,212,957	1,411,306	191,186	5,815,449
1889	4,162,930	1,493,578	334,044	5,996,552
1890	4,742,612	1,627,461	373,849	6,743,922
1891	4,870,572	1,829,786	308,627	7,008,985

The value of the fish landed in Scotland is little more than a third of that landed in England, yet, as we shall see below, the British Government has thought proper to spend a very much larger sum upon fishery investigation in Scotland than in England.

The following are the annual totals for several kinds of fish taken separately :—

TOTAL QUANTITIES FOR ENGLISH AND WELSH COASTS ONLY, FOR A SERIES OF YEARS, DISTINGUISHING THE DIFFERENT KINDS OF FISH.

Kind of Fish.	1886	1887	1888	1889	1890	1891
	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.	Cwts.
Soles .	98,078	85,316	72,522	74,143	72,129	82,688
Turbot .	59,850	63,166	55,041	53,576	51,879	56,875
Cod . .	248,197	256,155	245,497	301,405	363,374	360,511
Haddock	1,243,325	1,545,604	1,538,368	1,576,954	1,585,392	1,740,548
Mackerel	265,290	290,630	327,798	333,918	509,430	368,487
Herrings.	1,973,637	1,605,140	1,728,982	1,923,258	1,331,560	1,206,457
Plaice .	—	—	698,142	594,307	622,577	711,322

TOTAL QUANTITIES OF FISH LANDED IN THE UNITED KINGDOM FOR A SERIES OF YEARS, DISTINGUISHING THE DIFFERENT KINDS OF FISH.

Kind of Fish.	1888	1889	1890	1891
	Cwts.	Cwts.	Cwts.	Cwts.
Soles	76,253	78,714	76,667	86,502
Turbot	61,674	61,612	58,831	63,141
Cod	729,235	850,450	845,315	905,975
Haddock	2,369,012	2,379,552	2,354,849	2,487,239
Mackerel	430,107	777,515	1,002,421	670,164
Herrings	4,651,326	5,591,517	4,929,885	4,730,049
Plaice	—	—	—	—

AVERAGE PRICE OF SEVERAL KINDS OF FISH IN ENGLAND AND WALES FOR A SERIES OF YEARS.

Kind of Fish.	1886	1887	1888	1889	1890	1891
	Per lb. Pence.	Per lb. Pence.	Per lb. Pence.	Per lb. Pence.	Per lb. Pence.	Per lb. Pence.
Soles .	9·34	9·78	11·21	12·47	13·62	13·40
Turbot .	6·54	6·26	6·69	7·23	7·84	7·87
Cod . .	1·67	1·45	1·43	1·41	1·49	1·48
Haddock	·76	·75	·84	·88	1·03	1·09
Mackerel	1·44	1·23	1·63	1·47	1·65	2·10
Herrings	·51	·59	·60	·52	·77	·90
Plaice .	—	—	1·80	1·64	2·06	2·0·

Study of these figures shows that there has been a decrease in the quantity of soles and turbot landed in *England and Wales*, but not a continuous decrease, 1891 being better than either of the three preceding years. The other fish have all increased except herrings, which fluctuate somewhat irregularly.

The complete totals for the United Kingdom have only been available since 1888, and in the four years there has been an increase, though not a continuous or regular increase, in all kinds.

In spite of the slightly increased supply in 1891, as compared with 1888, there has been a steady rise in price in all these kinds of fish since that year, and all except cod are considerably dearer than they were in 1886 or 1887.

All this does not throw much light on the question of the productiveness of particular fishing grounds, nor on the relation of the product to the number of boats and men required to produce it.

“It seems,” writes Mr. Cunningham, the naturalist engaged in fishery investigations by the Marine Biological Association of the United Kingdom, “that the best test of the productiveness of the fisheries is the relation:—quantity of fish per fisherman, or per unit tonnage of fishing-boats. If it takes ten men in a larger boat to get the same quantity of fish as five men used to get in a smaller boat, then the fishery is only half as productive. Price depends on the demand, not on the cost of production, and the smaller supply of fish per man and boat may only reduce the interest on capital invested without reducing the wages of the fisherman.”

The Statistical Return of the Board of Trade gives no information as to bait as distinguished from fish landed as food. In England the baits used are various; whelks and mussels are largely used on the east coast, also herrings and lampreys; while at Plymouth, pilchard, mackerel, and squid are the kinds chiefly used. In Scotland, mussels are by far the most important and largely used bait. Squid is also used, and is imported in boxes and sold to the fishermen.

All that can be got from the tables for England and Wales is the item “Other Shell-fish”—that is, excluding crabs, lobsters, and oysters. It may be assumed that “other shell-fish” would consist largely of whelks and mussels used as bait, though it would also

include winkles and cockles. The quantities and values of this item are as follows:—

	Cwts.	£
1886	289,009	75,566
1887	343,720	87,727
1888	396,508	96,993
1889	460,398	118,747
1890	505,220	126,919
1891	533,492	150,758

The returns of quantities and value of mussels for the Scotch coasts only are as follows:—

	Cwts.	£	Price per Cwt.		
1886	257,022	14,439			
1887	276,086	15,381	0	1	1 $\frac{1}{4}$
1888	247,523	15,285	0	1	2 $\frac{3}{4}$
1889	187,708	11,622	0	1	2 $\frac{3}{4}$
1890	177,328	10,930	0	1	2 $\frac{3}{4}$
1891	231,063	14,329	0	1	3

These figures show a decrease in quantity and an increase in price.

In the Report to the Board of Trade by Mr. Malan, Inspector of Sea Fisheries, an extract from the Annual Statement of Navigation and Shipping is given every year since 1888. It gives the number of boats employed in English, Scotch, and Irish Fisheries, but not their tonnage. The number of men employed is also quoted. The total number of men and boys constantly employed in the several years are:—

1888	33,509
1889	33,474
1890	32,503
1891	33,044

A slight decrease.

	Boats registered.	Boats employed.
1888	8,417	7,275
1889	8,271	7,485
1890	8,050	7,006
1891	8,063	6,696

Such being some of the figures showing the extent and value of British Sea Fisheries, I pass on now to a history of what has been done during this century, with a view to improving the industry, especially during the last decade; and we shall have to note two definitely but inversely related factors, viz. (a) greater or less knowledge con-

cerning sea-fish ; and (b) more or less blundering laws and restrictions with regard to the prosecution of fisheries in territorial waters, and the sale of fish in the home market.

There is no doubt—and this may well be cited in view of the fact that the present report is written at the instance of the Royal Commission of the United Kingdom for the Chicago Exhibition of 1893—that an immensely increased activity in the study of questions relating to sea-fisheries may be in this country traced to the date of the great International Fisheries Exhibition of 1882, which was initiated and organised by Sir Edward Birkbeck. No doubt an increasing interest in the welfare of British fisheries led to the successful realisation of the proposed Exhibition ; but it is certain that the Exhibition itself immensely quickened that interest and made many British publicists, fishermen, and naturalists acquainted for the first time with the splendid museum and appliances of the American Fish Commission (which spends seventy-five thousand pounds a year on fishery investigation and management), and with French, Dutch, Norwegian, and other State Fisheries Departments. It also helped us to realise that the British Government was spending nothing at all upon the attempt to understand, and to manage intelligently, the sea fisheries of the United Kingdom. It is true that the profits derived from this Exhibition, amounting to several thousand pounds, were not expended in promoting that knowledge of sea fisheries which was unanimously declared by the foreign and British experts assembled in congress to be the one desideratum. But several valuable essays and lectures were published under the auspices of the directors of the Exhibition ; and, as an immediate outcome of the general interest excited, there was founded the Marine Biological Association of the United Kingdom, of which I shall have more to say below.

1800 to 1860.—In the early part of the present century there was no board or public office whose special duty it was to investigate, superintend, or enforce regulations upon the sea fisheries of the United Kingdom, except the Board of Commissioners of the British White Herring Fishery, appointed by Act of Parliament in 1808, and sitting in Edinburgh. The functions of this Board were to enforce regulations as to the mesh of nets used in the herring fishery, to collect returns, and make inspections of herrings cured in salt in barrels, to pay

bounties of 2s. per barrel on such cured herring. The system of inspection and bounty-paying in the herring-curing industry had been in force for nearly a century before that time, having been carried out under an Act passed in 1727 by the Board of Trustees for Manufactures and Fisheries, sitting likewise in Edinburgh.

The jurisdiction of the White Herring Commissioners extended to all places in Great Britain where the white herring cure was carried on, and, therefore, up till 1850, they received returns of such cure from ports in England. In that year the returns from England, with the exception of a few places near Eyemouth, ceased. In 1821, the herring-curing industry in the Isle of Man came under the jurisdiction of this Board, and continued so until 1869. During the whole time of its existence, from 1808 onwards, this Board collected compulsory returns of the number of barrels of herring cured, branded, and exported. Only herrings of proper quality and cure were branded, and the brand was necessary for the bounty. The returns furnish a very valuable and continuous series of statistics of the herring fishery—the only statistics we have down to a very recent period. In 1830, the payment of bounties ceased altogether; but the branding still continued by desire of the trade, and it has continued ever since, in spite of the fact that since the year 1858 a fee of 4*d.* per barrel has been charged for it, and since the withdrawal of the bounty no compulsion has been exercised.

In Ireland a Commission enquired very minutely into the Irish fisheries in 1835 and reported in 1837. On this report was founded the Act of 1842, which gave to the Irish Commissioners of Public Works the superintendence of the sea and river fisheries of Ireland. It empowered them to appoint inspectors of fisheries, and a subsequent Act added these inspectors to the Board under the title of Inspecting Commissioners. A little before 1866 the superintendence of the river fisheries was taken from the Board, and in that year there was only one Inspecting Commissioner. Although the powers conferred were very large, the policy of the Board in Ireland was always to do nothing except under pressure from the fishermen; their main efforts were directed towards preserving the peace rather than to increasing the value of fisheries.

1860 to 1882.—In 1860 Professor Allman, then Professor of Natural History in Edinburgh University, and Dr. Lyon Playfair, C.B.

(now Lord Playfair), both members of the Board of Fisheries, were instructed by the Scottish Board to inquire into the effects of beam trawling on the herring spawn deposited in the Fluke Hole, off Pittenweem; and in the spring of 1862 Professor Allman carried out, by means of divers and dredging, a search for herring spawn in the various parts of the Firth of Forth. About the same time Dr. Lyon Playfair and Vice-Admiral Dundas were requested to make investigations into the claims and conditions of the sprat fishermen of the Firth of Forth. The result of these enquiries were reported to the Board, but not published, except in a summary form in the Report of the Royal Commission upon the operation of the Act relating to Trawling for Herring on the Coasts of Scotland. This Commission was issued in 1862 to Dr. Lyon Playfair, Thomas Henry Huxley, and Charles Francis Maxwell. The "trawling for herring" referred to is simply catching herring with a seine, which was almost exclusively practised on the west coast of Scotland, especially in the Clyde estuary, and which had been entirely prohibited by Acts of Parliament passed in 1851, 1860, and 1861. The Report is valuable in giving a *résumé* of all that was known of the natural history of the herring up to that time, including the results of Professor Allman's search for herring spawn in the Firth of Forth in the spring of 1862. He found it only near the coast of the Isle of May. The Commissioners also found that there were two herring spawning periods in the year, one in spring and one in the autumn. The Commissioners recommended that the restrictive legislation be repealed.

In 1839, a Convention was concluded between the English and French Governments, defining the limits to within which the subjects of the respective Governments should have exclusive fishing rights, and agreeing that regulations should be made to prevent collisions between the fishermen. Regulations were made, and were published and made law by the Convention Act of 1843. Except with regard to oysters, the regulations which included restrictions as to mesh of nets and mode of fishing were not enforced.

In 1863, a Royal Commission, consisting of James Caird, Thomas Henry Huxley, and George Shaw Lefevre, was appointed to enquire, firstly, whether the supply of fish was increasing, stationary or diminishing; secondly, whether any modes of fishing practised were wasteful or otherwise injurious to the supply of fish; and thirdly,

whether the fisheries were injuriously affected by any legislative restrictions. The Report of this Commission was published in 1866. It contains evidence that the supply of fish was increasing generally, and not diminishing, with two exceptions, namely, that the oyster fisheries in the bays and shallow water along the coast were in a state of great depression; and secondly, that since 1845 the Irish fisheries had declined to half their previous extent and value. The Report states: "There are few means of enterprise that present better chances of profit than our sea fisheries, and no object of greater utility could be named than the development of enterprise, skill and mechanical ingenuity, which might be elicited by the periodical exhibitions and publications of an influential society, specially devoted to the British fisheries."

The Report states that the assertion of certain classes of fisherman that the beam trawl tears up and destroys the spawn of the fish has not been justified by the evidence adduced. It was found that the witnesses who made this assertion meant by "spawn" either the fry or young of fish, or that they called by the general name of spawn eggs of squids, jelly fishes, zoophytes, ascidians, and in fact all sorts of soft and gelatinous looking inhabitants of the sea which have nothing to do with fish. The Commissioners remark that very little is positively known respecting the spawning places of any kind of fish. They refer to the observations of Professor Allman as clearly proving that herrings spawn, at any rate in some seasons, on the coast of Scotland.

The Commissioners were convinced that a certain quantity of small and inferior fish was very generally taken in the beam-trawl, which, according to circumstances, was either thrown overboard or sold to the poorer classes. But they point out that these small fish are of the same kind as those of larger dimensions on which the profits of the trawlers depend, so that they themselves would be the sufferers if any injury to the supply of fish were to ensue. It had never been alleged that ling, cod and conger—in which the line fishermen are so largely interested—or mackerel, pilchards or herrings—upon which seine and drift fishermen depend—were caught by the trawl in an immature or uneatable condition. The Commissioners conclude that beam-trawl fishing should not be interfered with.

In 1878 a Commission was given—not by the Queen, but by Richard Assheton Cross, the Home Secretary—to the then Inspectors of Salmon Fisheries for England and Wales—namely, Frank Buckland, Esq., and Spencer Walpole, Esq.—to make inquiries—

- (1) Into the use of the trawl-net or beam-trawl in the inland seas and territorial waters of England and Wales.
- (2) Into the use of the seine-net or ground seine on the coasts of Cornwall and elsewhere.
- (3) Into the alleged destruction of the fry and spawn of sea fish in the estuaries of rivers and in bays by the above and other modes of fishing.

The Report of these two Commissioners was published in 1878, and forms one of the most lucid and interesting among reports of a similar character. It gives an excellent account of the condition of the sea fisheries at the time, and in an Appendix gives a comprehensive survey of all that was known at the time about the natural history of marine food-fishes.

As to the wasteful destruction of spawn, the Report says that the spawn of soles, turbot, plaice and other like fish, after their extrusion under natural circumstances from the parent fish, was entirely unknown; that the spawn of the cod and other fish of the cod family had been proved by Sars in Norway and Baird in America to float about as separate eggs in the water; and that the spawn of the herring was known to be deposited on the bottom. This was all the knowledge available, and there was no evidence that the spawn of fish was disturbed or destroyed by any method of fishing practised. The young fry were—the Report says—better known, and trawls, seines, and fixed nets undoubtedly destroyed large numbers of those kinds whose young seek the shore and enter bays and estuaries; while trawls destroyed a number of small soles, plaice and haddocks, six or seven inches long, out on the deep-sea grounds. The Commissioners believed that on the whole the supply of fish was as great as ever, but there was a general impression that soles—and in some cases plaice and flounders also—were actually decreasing.

The Commissioners consider possible regulations to prevent the destruction of immature fish, and conclude that it is inadvisable to interfere with methods of fishing, while prohibition of sale would be of no use, because the fish if too small for sale are not sold now,

and if large enough for sale would be dead when returned to the sea. They recommend that the provisions of the Act of 1841, prohibiting other kinds of fishing near seiners at St. Ives, and of the Sea Fisheries Act of 1868, prohibiting drift net and trawl within two miles of the shore, etc., should be repealed. (The recommendation has not been carried into effect.) They recommend that the Secretary of State should be empowered after due enquiry to prohibit trawling in territorial waters where necessary, that the Inspectors of Salmon Fisheries should be empowered to collect statistics of sea fisheries, and that all the fishery interests of England and Wales should be placed under a common centre.

1882.—The former Board of British White Herring Fishery was dissolved on 16th October, 1882 (Act 45 & 46 Vict. cap. 78), and the Fishery Board of Scotland established. The first members of the new Board were:—Sir Thomas J. Boyd, *Chairman*; John Guthrie Smith, Sheriff of Aberdeen, Kincardine and Banff, *Deputy-Chairman*; George H. Thoms, Esq., Sheriff of Caithness, Orkney and Shetland; Alexander Forbes Irvine, Esq., Sheriff of Argyle; Sir James Ramsay Gibson-Maitland, Bart.; Stephen Williamson, Esq., M.P.; Professor Cossar Ewart, M.D.; James Mantene Graham, Esq.; James Johnstone Grieve, Esq.; Dugald Graham, Esq., Secretary; Archibald Young, Esq., Advocate, Inspector of the Salmon Fisheries of Scotland.

The new Board being not only required to make suggestions for the improvement of the Fisheries, but being empowered also to take such measures for their improvement as the funds under their administration and not otherwise appropriated might admit of, and taking into consideration also the important practical results obtained by the U.S. Commission of Fish and Fisheries, decided to institute investigations into the habits and life history of some of the more important food-fishes, such as the herring, cod, ling, haddock, mackerel, sole, plaice, and flounder.

The following questions are mentioned in the First Annual Report, 1883, as deserving careful investigation:—

- (1) The food, life-history, distribution, and migrations of useful fishes.

- (2) The nature of the feeding and spawning grounds of food-fishes.
- (3) The period of spawning, nature of the ova, and the time required for, and the conditions favourable to, hatching.
- (4) What means can be adopted for the protection of fish during their early stages of growth, and what can be done to prevent the destruction of immature fish.
- (5) What new useful fishes (such as the American shad and the land-locked salmon) can be introduced, and how far the supply of our present forms can be increased by artificial cultivation or protection during the spawning period.
- (6) The influence of atmospheric variations, and of the changes of the temperature of the water, and of currents, on the presence and migrations of fish, and the nature and depth of the water where fish commonly abound.
- (7) The special enemies of useful fishes, and the causes of the disappearance of fish from certain districts.

Also desirable to make a collection of useful fishes and their food.

As the artificial cultivation of cod or other fish required more appliances than the Board could command, they determined to commence with the investigation of the food and early life-history of the herring. They therefore applied to the Home Secretary to ask the Lords of the Admiralty to grant the use of a steam pinnace. The application was declined.

1883.—From the Second Report of the Board, giving its proceedings in 1883, published in 1884, we learn that in the late summer of 1883 the Admiralty consented to the use of the *Jackal*, a steamer usually employed in fishery protection service, for a preliminary enquiry into the herring and herring fishery. The expenses of this enquiry were to be met out of the sum voted for travelling, and a small wooden laboratory on the coast of Ross-shire, belonging to Mr. Romanes and Professor Ewart, was lent by them for the work of the Board. These enquiries produced but little result, partly because there had been little time to make previous arrangements, partly because those engaged had little experience in such investigations.

At the suggestion of Professor M'Intosh, of St. Andrew's, who

had been all his life a keen student of marine zoology, the Board agreed to co-operate with him in providing for the expense of fitting up a small building on the shore there as a marine laboratory, in which researches on food fishes could be carried on. With the sanction of the Treasury a sum of £335 was devoted by the Board to this purpose, and Professor McIntosh commenced experiments and observations on the floating eggs of flat-fishes. The Scientific Appendix to this Report includes a note by Professor McIntosh on these earliest researches at the St. Andrew's Laboratory, consisting of the artificial fertilisation of the eggs of the cod and flounder and a few other fishes.

In the winter of 1883-84, Mr. Duncan Matthews examined samples from the sprat fishing in the Firths of Forth and Tay, and reports on the varying percentages of sprats and young herring in the takes.

In March, 1884, Professor Ewart made an examination of the Ballantrae Bank, reputed to be a herring spawning bed. It was found to be covered with herring spawn, and the results of this examination are the most valuable obtained hitherto by the scientific enquiries of the Board. On the other hand, description and figures of eggs from the east coast are given in this Report as eggs of the herring which were afterwards proved not to belong to the herring at all; and a common fish, *Sebastes*, is described erroneously as another rare genus, *Cabrilla*.

The Treasury only sanctioned £900 for the scientific work from funds already in the hands of the Board, chiefly herring-brand fees. £300 of this was required to meet expenses already incurred, £335 for St. Andrew's, so that, the balance being very small, scientific work was almost suspended in the summer of 1884.

1883.—In 1883 a Royal Commission was appointed to enquire into the injuries alleged to be inflicted upon line and drift-net fishermen by the use of the trawl-net and beam trawl in the territorial waters of the United Kingdom. A sum of £200 was granted to this Commission for the purpose of conducting scientific observations upon the results of the use of the beam trawl; and in January, 1884, Professor McIntosh was appointed to make these observations. The members of this Commission were :—John William, Earl of Dalhousie (since deceased); Edward Marjoribanks, M.P.; Thomas Henry

Huxley, F.R.S. ; William Sproston Caine, M.P. ; Thomas Francis Brady. Ninety-three hauls of the trawl on board an ordinary steam trawler were made under the observation of Professor McIntosh, who reported to the Commission in November, 1884. His report was printed as an appendix to the Report of the Commission, published in 1885.

Professor McIntosh's cruises were made off the mouth of the Firth of Forth and off Aberdeen. Three days were also spent in trawling in a private steam yacht off Scarborough, and two days in St. Andrew's Bay, in the *Medusa*, belonging to the Granton Marine Station. His report contains a deal of information, though, as might be expected, it is by no means so precise as that obtained by subsequent researches of a similar kind. It contains tables showing the fish captured in the various hauls under three heads—saleable fish, immature fish, and unsaleable fish. The latter title applies only to those species of fish which are entirely unmarketable, for which there is no demand for any commercial purpose: they are the frog-fish (*Lophius piscatorius*), two kinds of dog-fish, and a few common shore fishes of a small size. The title "immature fish" is applied to those individuals of marketable species which were so small as to be useless for the market; while saleable fish are those which were taken ashore for sale. The great defect of the Report is that no information whatever is given as to the limit of size dividing the saleable fish from the immature.

Thus all that can be got from the tables is the proportional numbers of the individuals thrown overboard after capture, and of those kept for the market. On the fishing grounds where the observations were made true soles are very scarce—only 78 were taken, and none were rejected; also of turbot and brill none came under the heading "immature." One-fourth of the total number of plaice captured were rejected from their small size; while of common dabs and long rough dabs, ten times as many were thrown overboard as were taken to market, these being rather small fish even when adult. There is little in the Report to enable the reader to judge how far the fish thrown overboard survive to reach a larger size, although a section is devoted to the question of whether the fish are alive or dead when taken from the net. However, the

actual waste of fish of valuable kinds—with the exception of common dabs and long rough dabs, which are of very little importance in the market—is shown to be very small indeed. The only species in which the waste, if the immature specimens do not survive when returned to the sea, is serious, is the plaice.

The Report of the Commission itself was a most important one, not only from the nature of its conclusions and recommendations, but from the fact that many of them have been put in force by legislation. It is worthy of note that, in consequence of ill-health, Professor Huxley was unable to take any part in drawing up the Report, and therefore did not share in the responsibility for its conclusions and recommendations. The Report states that, in the absence of reliable statistics by means of which the then supply of fish could be compared with that of previous periods, the Commission was unable to estimate the degree to which diminution had taken place, although it considered that the supply of certain kinds of fish in certain places in the territorial waters had diminished in recent years. The Commission recommended that statutory powers and means should be given to the fishery authorities to enable them to collect fishery statistics. It was of opinion that the productiveness of the fishery grounds should be regularly and periodically examined by competent persons, as well as all circumstances bearing upon fishery questions. The Commissioners thought that the proposed investigations of the Scottish Fishery Board were of a useful and practical character, and worthy of the expenditure of public money. They recommended that experiments should be made to test the effect of trawling, and for this purpose power should be given to the authorities to prohibit trawling in territorial waters when and where they thought fit. Scotland and Ireland possessed Fishery Boards, but England had no analogous authority. Such an authority, the Commission declared, should be created for England at once; and on it, as well as on the Scotch Board, should be conferred the regulating powers already possessed by the Irish Board. They also thought that one central authority should be created for the United Kingdom, but in the meantime the Scottish Board should have all the powers and funds it asked for. The latter recommendation has been carried into effect, but the former has been neglected. The Commission recommended that, as a temporary measure, the large powers of a fishery authority

in England should be conferred upon the Secretary of State for the Home Department, or on the President of the Board of Trade.

1884.—On the 31st March, 1884, the Marine Biological Association of the United Kingdom was founded and constituted at an influential meeting held in the rooms of the Royal Society, at Burlington House, London. Professor Huxley was its first President, and the writer of these notes, who initiated the movement, became its Honorary Secretary. The Association immediately set about choosing a site for a well-equipped and permanent marine laboratory. The site chosen was one granted to the Association by the War Office, on the Citadel Hill, Plymouth, where the Laboratory now stands. At the first annual meeting of the Association in 1885, subscriptions to the amount of £8,000 were announced; in 1886 the amount reached nearly £15,000, including £5,000 from H.M. Treasury; and in 1887 the laboratory was almost finished, and active work was commenced.

In October, 1884, the sum of £1000 was placed by the Government from the Public Treasury at the disposal of the Scottish Fishery Board for scientific investigations. During the previous summer the scientific work of the Board had been in great part suspended. Nevertheless the Marine Station at St. Andrew's was completed in the autumn of 1884, and researches into the natural history of food fishes commenced there. In the same autumn Professor Cossar Ewart was sent to the United States to study the methods and operations of the Fish Commission of that country. In January, 1885, Mr. George Brook was appointed as a salaried naturalist to work under the instructions of the Board, and under his supervision a wooden marine laboratory was erected at East Loch Tarbert, on the Firth of Clyde. The Board had also the use of the Rothesay Aquarium for biological observations and experiments, and a small wooden laboratory on the shore of Cromarty Firth on the east coast of Scotland. Thus at the beginning of 1885 the Board had no less than four marine stations for investigation, besides the resources of the Natural History Department of Edinburgh University.

The investigations carried on in 1884-85 were principally observations on the spawning of herring and cod at Rothesay. These observations were published in the Board's Third Annual Report for 1884. A number of cod were observed spawning in March in the Rothesay Aquarium, and the eggs were found floating at the surface

of the tanks ; the fish merely swam about at random while shedding the eggs and milt. The same Report contains an account of the Marine Laboratory at St. Andrew's, and work done there, the latter consisting of observations on the eggs of the viviparous blenny and other useless fishes, and on the eggs of the herring, the young of the ling, of the eel, and of the cod. Mr. Brook contributes some notes, the most important of which is a short paragraph stating that certain eggs, sent by fishery officers attached to *Sertularian polyps*, were not herring eggs. In the Second Report of the Board such eggs were figured as those of the herring, and important conclusions drawn from their occurrence as to the period during which herring were spawning on the East of Scotland. It is necessary to note this and other errors and their rectification, as shewing the ignorance of essential facts which has obtained, and the need of patient research and experience for the gradual attainment of trustworthy information.

In the same year 1884 was opened a Marine Station on a small scale at Granton, near Edinburgh. The origin of this enterprise was the grant to the Scottish Meteorological Society, of the surplus money from the Edinburgh Fisheries Exhibition of 1882. At the time, both that society and the Fishery Board were anxious to carry on scientific investigations into questions affecting the sea fisheries. The Granton Station was organised and governed by Dr. John Murray, subject to the approval of the Scottish Meteorological Society. The establishment consisted at first of a small floating laboratory, and a steam-yacht, the *Medusa*, fifty-one feet in length. For some years, besides Dr. Murray himself, four scientific observers worked for this institution—Mr. J. T. Cunningham in zoology, Mr. Rattray in botany, Mr. Henderson in zoology, and Dr. Mill in chemistry and physics.

The work of the Granton Station was of a more severely scientific character than the work at that time carried on by the Scottish Fishery Board. Mr. Cunningham at once engaged in the investigation of the eggs and development of sea-fishes, including food-fishes. In the summer of the same year he described for the first time in this country a pelagic egg and larva, afterwards proved to belong to the sprat. In the autumn he artificially fertilized herring eggs on the coast of Northumberland, and published a con-

tribution to the knowledge of their development in the *Quarterly Journal of Microscopical Science*. In 1885 he published an account of the pelagic eggs of the cod, haddock, whiting, and gurnard, the first account with exact measurement and figures of the pelagic eggs of these fishes in this country. Professor McIntosh described pelagic eggs of these and other fishes in the Trawling Commission's Report in 1885, and in a short note in 1884, but without figures. In 1886 Mr. Cunningham published a comprehensive memoir including, with new contributions by himself, a survey of the work done up to that time in the development of marine fishes. In the same year he also published the discovery of the hermaphroditism, and the nature of the egg capsule in *Myxine glutinosa*, the hag-fish, which is so troublesome an enemy to fish and line fishermen on the north-east coast. In 1887, in collaboration with Mr. Ramage, he published a comprehensive account of the sedentary annelids of the Firth of Forth.

Dr. Mill's work at the Scottish station constituted an important advance in the science of hydrography, not merely in results, but in methods of observation.

In 1887, Mr. Cunningham transferred his services to the Marine Biological Association at Plymouth, and since then little work of direct utility to the fisheries has been done by the Scottish Marine Station, the other members of the staff having been already obliged to seek more remunerative posts in 1885 and 1886. The work of the *Medusa* has however been continued on the west coast of Scotland by Dr. Murray and many men of science who have co-operated with him; and research has been continued from time to time both at Granton, where a laboratory on shore was obtained, and at Millport on the Clyde, to which place the floating laboratory was transferred; these researches have resulted in large additions to the knowledge of the marine fauna of the Clyde and to other branches of marine science.

1885–86.—A considerable amount of work was accomplished under the auspices of the Scottish Fishery Board in the year 1885–86, the principal contributors being Mr. Brook, Professor Ewart, Professor McIntosh, and Mr. Duncan Matthews. Mr. Matthews made an elaborate investigation into the question of varieties among the herrings of the Scottish coasts, with the object of ascertaining how

far examination of these herrings confirmed or contradicted the conclusions reached with regard to the herrings of the Baltic by Dr. Heincke, of the German Fishery Commission, working at Kiel. The report of Mr. Matthews in the Fourth Report of the Board is very detailed and valuable, though it by no means settles the question. The general conclusion is as follows: Dr. Heincke divided the Baltic herring into two varieties, and *each* of these into spring and autumn varieties or races. While there is some reason for believing that the spring and autumn races are distinct on the coast of Scotland, there is no evidence of any further racial distinction. The most important items of the rest of the work, where results are published in the same Report, are observations on the herring fishery of Loch Fyne, determination of the species of Copepods and other animals taken in Loch Fyne, valuable Reports on the food of the herring, cod, haddock, by Mr. Brook, and a Report on the proportion of herrings and sprats in Thames and Forth whitebait. Work was also carried on at St. Andrew's Laboratory by Professor McIntosh and Mr. Prince. The results of these enquiries are described in the Board's Fourth Report, published in 1886. In the same Report it is stated that, in consequence of the recommendations of the Beam Trawling Commission, above summarised, the Sea Fisheries (Scotland) Amendment Act, 1885, was passed, conferring upon the Scotch Board power to prohibit by bye-law trawling or any other mode of fishing in any part of the territorial waters of Scotland. Under this Act the Board made a bye-law prohibiting trawling in the Firth of Forth, St. Andrew's Bay, and Aberdeen Bay, as an experiment for the purpose of ascertaining the result of the prohibition on the supply of fish on the grounds so protected. The Board then applied to the Treasury for funds to enable them to purchase a small vessel for trawling. The sum of £3000 was granted, and the steam fishing-yacht *Garland* was purchased at the price of £2500. This vessel was 92 feet long, 15 feet 10 inches beam, and $8\frac{1}{2}$ feet draught. She was built of iron. She was fitted with a trawl of 25 feet length of beam, with which she was to trawl over the protected grounds in order that the number of fish obtained from them at different times might be carefully and accurately ascertained.

In the Board's Fifth Report, published in 1887, an account is given of the operations of the *Garland*. It was decided not to close

Aberdeen Bay any further, but by new Bye-laws the territorial area in the Moray Firth was closed, and the Firth of Forth and St. Andrew's Bay areas were extended. Mr. W. L. Calderwood acted as naturalist on board the *Garland*, and Mr. Duncan Matthews superintended the course of the trawling observations from the University of Edinburgh, collating and tabulating the returns forwarded from the *Garland*. Mr. Brook had charge of the work on the west coast; while Prof. McIntosh continued his studies on the life histories of food-fishes at the St. Andrew's Laboratory. Beyond the records of the experimental trawling observations, the description of scientific investigations forming Appendix F to the Fifth Report does not contain much of great magnitude and importance. Mr. Matthews contributes a second elaborate report on varieties found among individual herrings from the east coast of Scotland, and concludes that even the distinction between spring and autumn herring is difficult to make certain of. He also gives an elaborate description of the skeleton of the herring. Additional papers on the food of fishes are given, namely, of the whiting and young Gadidae. The statistics of fish taken by the *Garland*, and landed by ordinary boats, are given in a number of detailed tables occupying 157 pages.

In 1886 certain departmental changes were made in the English public service with respect to business connected with the fisheries. The jurisdiction of the Home Office in respect of salmon and fresh-water fisheries was transferred to the Board of Trade by the Salmon and Fresh-water Fisheries Act, 1886. A Fishery Department of the Board of Trade was organised, at the head of which was placed an Assistant Secretary (Mr. G. Swainston). Mr. Berrington and Mr. Fryer, the Inspectors of Fresh-water Fisheries at the Home Office, were transferred to the new department, and a third Inspector (Mr. Malan), specially for sea fisheries, was also appointed. The new department publishes annually a return of statistics of sea fish landed on the coasts of the United Kingdom, and a Report on the Sea Fisheries, in addition to the Report on Salmon and Fresh-water Fisheries, which was continued. But the department *has no power to make scientific investigations*, nor to make bye-laws or regulations affecting the sea fisheries.

The anomalous position of fishery affairs in England and Wales has been since still further increased by the Sea Fisheries Regulation

Act of 1888, which is of a permissive character, and allows the Board of Trade to create Sea Fisheries Districts on the application of county or borough councils, to be under the jurisdiction of district committees formed partly by members of the county or borough councils, partly by outside members. The powers of such district committees are larger than any previously exercised by the Board of Trade. They can make bye-laws to regulate the fishing in the territorial waters of their district to any extent they please, and provide for their expenses out of the local rates. Such Sea Fisheries Districts have now been created round nearly the whole coast of England and Wales.

1887.—In August, 1887, the Marine Biological Association issued its first publication, the first number of its journal. This number contained a full description, with plans, of its fine laboratory at Plymouth, and a valuable detailed description of the fishing industry at the port of Plymouth by Mr. Walter Heape. The second number, issued in 1888, contains a paper on some preliminary investigations made by Mr. J. T. Cunningham (then appointed as naturalist at the Plymouth Laboratory), on the local fauna and the ova of food-fishes. In this first paper, Mr. Cunningham had already solved the mystery of the male sole, and the question of the reproduction of that species, previously unknown. In 1885, it had been stated to the Beam Trawling Commission that no one had ever seen a male sole; that the female soles were caught, but not the males. Mr. Cunningham found that the male soles were abundant enough, but had simply not been recognised, and he artificially fertilised soles' eggs for the first time.

In the Sixth Report of the Scottish Fishery Board, published in 1888, the chief feature is again the statistics of the *Garland* relating to trawling, and the abundance of fish in areas where trawling was prohibited. The data are too voluminous to be easily discussed here; but it is interesting to note that those who directed the observations were beginning to see that something more was required than merely collecting and comparing the totals of the fish captured. It was found that in 1887 more flat-fish were taken in the closed areas than in 1886. But it may reasonably be objected that in these two years the Fishery Board did not fully understand the problem which had to be solved. It prohibited trawling in certain areas, and then made observations to see if the fish increased in

these areas. As a result the Scotch Board points out that the number at least of flat-fish was greater. Commenting on this, Mr. Cunningham writes: "The result in other words was that if fish were not caught they would remain in the sea. For flat-fish are not to any great extent migratory, and line fishing, which was unrestricted, does not catch so many of them as line fishing and trawling together. Of course if a powerful check to population is removed, provided that food is abundant, population will increase; and in these closed areas the population of flat fishes was probably increased, not only by reproduction, but by occasional immigration from the outer grounds. The problem that has to be solved appears to be a different one; it is, how can we maintain the total annual yield of the sea-fisheries? It is a very simple remedy for the diminished yield of the fisheries to leave off fishing, and one not likely to be adopted while a margin of profit remains. The question is whether by certain particular restrictions the general supply can be maintained or increased, or at least prevented from diminishing. It must on the other hand be admitted that the Board had some reason on its side in considering the question of trawling in relation to territorial and inshore waters, and how it affected the fishing which previously went on at scattered villages along the coast."

Perhaps the most important results of the operations of the *Garland* were the information subsequently obtained from her operations under Dr. Wemyss Fulton's guidance with regard to the life-histories of valuable fishes. The shorter papers included in the Sixth Report are of no striking importance; but one tracing the colour of "red cod"—*i.e.*, the discoloration of dried cod-fish—to microbes deserves mention.

1888.—The work of the Scottish Fishery Board in 1888, described in the Seventh Report, 1889, consisted, firstly, of a continuation of the laborious observations on the condition of the inshore fishing grounds, where trawling was prohibited; some observations on the "spawning grounds" of plaice and other fishes; systematic inquiries into the distribution and capture of immature fish; an examination of the trawling grounds to the west of the Hebrides, and certain special inquiries. In this year and the preceding, the scientific work was under the control of a Committee of the Board; and Dr. Wemyss Fulton, who began to work for this Committee in

1887, in 1888 acted as Secretary to the Committee, and was entrusted with the organisation of much of the fishery researches with very satisfactory result. The most important of the remaining papers in the Seventh Report is one by Professor McIntosh on the pelagic fauna of the Bay of St. Andrew's during 1888.

The actual work of the Marine Biological Association at the Plymouth Laboratory commenced in June, 1888; the staff consisting only of the Director of the Laboratory, G. C. Bourne, Esq., Fellow of New College, Oxford, his assistant, W. Garstang, Esq., B.A. and J. T. Cunningham, Esq., M.A., Fellow of University College, Oxford. All three gentlemen were thoroughly trained zoologists. It should be clearly pointed out that the declared object of the founders of the Marine Biological Association was "to promote researches leading to the improvement of zoological and botanical science, and to an increase of our knowledge as regards the food, life-conditions, and habits of British food-fishes and molluscs"; and this double purpose of pure scientific investigation on the one hand, and of special fishery study on the other, has been strictly adhered to by the Council in its management of the funds at its disposal. The Fishmongers' Company contribute £200 a year to the Association, whilst Her Majesty's Government have given £500 a year in the years 1888-89, 1889-90, 1890-91, and £1,000 a year in the years 1891-92, 1892-93 and 1893-94. Private individuals have given annual donations of £200 and upwards to promote special researches. Besides the investigations noted in the present report, which have contributed importantly to our knowledge of food-fishes, the Plymouth Laboratory has to reckon, as a no less important outcome of its activity, a long list of scientific memoirs on the embryology and anatomy of marine organisms of all kinds, the result of researches made within its walls by British and foreign naturalists who have availed themselves of the facilities for study there provided.

Mr. Cunningham devoted his time on first coming to Plymouth to the study of the reproduction of the fishes of the region, and published his first fully illustrated paper in the No. of the Journal for March, 1889. In this paper the eggs and larvæ of a number of fishes were described and figured. Among them the spawning and development of two important food-fishes were accurately made known for the first time—namely,

the sole and pilchard; while the development of the mackerel was described for the first time in this country. The egg of the sole had been found to be buoyant and pelagic by Professor McIntosh in 1884, but he gave no description of its characteristics, nor figures, nor did he identify the male. The characteristics of the sole's egg, as actually taken from the ripe female, were first described by Mr. Cunningham in the *Journal of the M.B.A.* in 1888. Eggs obtained by the tow-net from the sea were attributed to the common sole by Professor McIntosh at St. Andrew's in 1888, and briefly described by him in the *Fishery Board Report* in 1889. They are more fully described and figured in the memoir by McIntosh and Prince, which was communicated to the Royal Society of Edinburgh in 1888, but not published till 1890. Thus the study of soles' ova was commenced at St. Andrew's and at Plymouth in the same year, but the complete evidence of identification derived from examination of ova taken from the fish itself and artificially fertilized, the distinction between the eggs of the common sole and those of other species, and the description of the peculiarity of the breeding organs in the male, are due to Mr. Cunningham only. In the second number of the *Journal of the Marine Biological Association*, some important observations on the distribution of immature fish at Plymouth are given.

The increase in the take of the *Garland's* trawl in the closed areas recorded for 1887 was not maintained for 1888, although in the latter year the take was still greater than in 1886. But the important fact was established from the records that, whereas most species of fish, especially flat-fish, spawn in the extra-territorial waters, the young soon after hatching seek the territorial inshore waters and there pass their early life. This general statement has been worked out in detail since this date, for of course it was necessary to analyse it into statements concerning particular species. At Dr. Fulton's suggestion, the *Garland* carried out a series of trawlings with a special small-meshed net to trace the distribution of immature fish. It is worth noting that, whereas the records of fish taken by the *Garland* in 1886 and 1887 only give the sizes as large and small, &c., and no other information, in 1888, under Dr. Fulton, the actual size is given, and the condition in respect of maturity, and also the contents of the stomachs.

1889.—In 1890 were published two elaborate memoirs on the development and life histories of food-fishes, namely, "The Development and Life Histories of Teleostean Fishes," by Prof. McIntosh and Mr. E. E. Prince (Trans. Roy. Soc. Edin. xxxv., 3), and "A Treatise on the Common Sole," by J. T. Cunningham, naturalist on the staff of the M.B.A., Plymouth. Of the first memoir, which is somewhat voluminous, the first ten sections have little direct bearing on fisheries, treating of the development of the eggs of fishes as a purely zoological subject. Section XI. is devoted to the embryonic larval and post larval stages of fishes, and forms a valuable contribution to our knowledge of the eggs of fishes and the earliest condition of the young after hatching. Section XIII., the last, is perhaps the most important part of the memoir, giving a full account of the previously unknown eggs and development of the cat-fish, *Anarrhichas lupus*, a fish which is common on the east of Scotland, and sometimes eaten, though not of great value in the market. The memoir is illustrated by 28 lithographed plates.

Mr. Cunningham's memoir on the sole is a valuable contribution to our knowledge of that species in particular and of flat fishes in general. It is illustrated by 18 plates, to the production of which very great labour and expense were devoted. Nine of the plates are elaborately-executed chromo-lithographs, prepared from water-colour drawings made from life by an artist specially employed for the purpose. These plates illustrate the characters and appearance of the four British species of sole, the changes in the colour of the common sole on different grounds, and the position and relations of the breeding organs in their natural position as seen on dissection. The other plates illustrate the anatomy of the sole, and the eggs and transformations of the young in this and other species of flat fishes. The latter two sections of the four into which the memoir is divided contain a full and careful discussion of the natural history of the sole, and the bearings of this upon the production of soles for the market. The artificial propagation of the sole, which has been carried out only at the Plymouth Laboratory, is fully considered, and is shown to be beset with certain difficulties not met with in connection with other kinds of food-fish. These difficulties are chiefly caused by the remarkably small size of the

male breeding organs or milts in the sole, a peculiarity to which was due the fact that previous observers failed to recognise the male sole at all.

We find from the Eighth Annual Report of the Scottish Fishery Board, published in 1890, that in 1889 the scientific work had been entirely superintended by Dr. Wemyss Fulton, acting under the instructions of the Board, the Scientific Committee having ceased to act. In this Report the trawling observations are discussed on the usual plan for the year 1889, and show a still further decrease of fish in the closed areas—a somewhat different result from that originally anticipated. The most important part of the Report is Dr. Fulton's paper on the "Distribution of Immature Fish and their Capture by different Modes of Fishing," based upon observations specially made by the Board's investigation steamer *Garland*. This paper contains the first attempt made to ascertain the *size* at which each species of food-fish becomes mature—that is, the size at which it breeds for the first time. This was done merely by finding the sizes recorded of the smallest ripe, or nearly ripe, specimen of the various species examined. The distribution of the fish above and below these limiting sizes is lucidly described, and we have here the first contribution of importance to our knowledge of the differences among the different kinds of fish as to the regions inhabited by the young. It was previously stated that the inshore grounds were nurseries for young fish. It was now proved that this is true only of certain kinds of fish, and especially of the plaice. Another important contribution by Dr. Fulton deals with the relative numbers and sizes of the *sexes* in food-fishes.

The two numbers of the *Marine Biological Association Journal* published in 1889 contain accounts of much important research bearing on fisheries. Among the papers may be mentioned one by Mr. Cunningham on young stages of Teleostean fish occurring at Plymouth, and another by Mr. G. C. Bourne on the destruction of immature fish.

1890.—The Report of the Fishery Board for Scotland for 1890, published in 1891, contains nothing very novel, but important continuations of the investigations described in the preceding volume of the series. The records of the trawling experiments of the *Garland* are continued, and also some special fishery statistics in continuation of

those of former years. Dr. Fulton publishes a second paper on immature fish, giving the result of an experimental investigation of the problem whether the small fish are killed by capture in the great trawl or in the shrimp trawl, or whether they are alive and survive if returned to the sea. He concludes that in great trawls the flat-fish are alive and not killed usually, while the round fish are fatally injured, and that in the shrimp trawl the small fish captured are uninjured.

In the year 1890 an important fishery survey was organised in Ireland. The Royal Irish Academy had in previous years made explorations of the sea-bottom of the south-west coast of Ireland by the agency of the Rev. W. Spotswoode Green. In 1887 the Royal Dublin Society, whose function is to promote industries, rather than pure science, began to utilise Mr. Green's services in the examination of the condition of the fisheries in the south and west of Ireland. At the end of 1889 the Chief Secretary for Ireland approved of a suggestion that the Society should organise a survey with the object of ascertaining the amount and distribution of the fish supply on the west coast. The estimated cost was found by the Society to be £1200 per annum for two years, and the Government agreed to provide half the money, the Society the other half. The execution of the project was entrusted to the Rev. W. S. Green, who conducted a fishery surveying cruise in the s.s. *Fingal* in the spring and summer of 1890. Mr. Green was appointed Director of the Survey, Professor Haddon, naturalist, and Mr. T. H. Poole, C.E., surveyor. As the survey was commencing, Mr. Green was appointed one of the inspectors of Irish Fisheries, but this made no difference in the plans. A narrative of the first cruise was published in the Report of the Royal Dublin Society for 1890; but the complete results of the two years' work were not published till 1892, when they were printed in the Report of the Council of the Society for 1891, and in the Proceedings of the Society. This statement of result, under the title, "Report on the Results of the Fishing Operations of the Survey," was prepared by Mr. Ernest W. L. Holt, who bore the principal share in the natural history work in the two cruises of 1890 and 1891. Professor Haddon took charge of the work on board ship for a short time in 1890, but not in 1891. The plan of operations in the natural history department was devised by Professor Haddon. Mr. Holt's Report consists first of a list of the stations examined, with a list of the fish caught at

each, and an indication of the invertebrates taken with them; secondly, of a record of all the fish caught under the heading of each species; thirdly, of a discussion of the scientific evidence on economic questions afforded by the examination of these fish. In this last part of the Report we have the determination for the west coast of Ireland of the (1) spawning period of fish and the distribution of the spawning fish; (2) definition of immature fish and comparison of the habitats of mature and immature fish; (3) the effect of different nets upon the capture of immature fish; (4) the food of fishes. With respect to the definition of immature fish in the several species, Mr. Holt makes an improvement on Dr. Fulton's method. Dr. Fulton ascertained the smallest size of ripe and nearly ripe fish without regard to sex, but mentions at the same time that the smallest ripe specimens in nearly all instances were males. Mr. Holt gives tables in which the maxima and minima of ripe and nearly ripe specimens are given for the two sexes separately, and then in discussing the distribution of mature and immature forms, divides them by the size of the smallest ripe *female*. Mr. Holt's report also contains in many cases information as to the habitat of the very young individuals of several species which do not pass their young state in shallow water, and which in their early stage had not been obtained before, *e.g.*, lemon sole (*Pl. microcephalus*), pole dab (*Pl. cynoglossus*), and others. Mr. Green at first announced that the young of such forms obtained in very deep water were the young of the common sole; but when this conclusion was challenged by Mr. Cunningham, of Plymouth, from his own experience, the mistake was discovered and acknowledged. The results obtained by the Survey are very valuable, and will form a most useful basis for attempts to develop the deep sea fishery on the west coast of Ireland. If the Government were to provide means for a similar survey of the east coast of England and in the North Sea, the result would go very far to settle the question of immature fish which is now agitating the industry in that region. As it is, the conclusions obtained on the east of Scotland and the west of Ireland cannot be applied directly to the east of England, and in consequence the Marine Biological Association is now endeavouring, with a single naturalist (Mr. Holt) and without a surveying ship, to do there what was thoroughly done with special Government aid on the west of Ireland.

The first number of the *Marine Biological Association Journal* for 1890 contains statistics of the mackerel and lobster fishing at Plymouth, a paper on the marine fauna of Plymouth by Mr. Garstang, and two papers on food-fishes by Mr. Cunningham. The first of these two papers is a comprehensive account of the reproduction and development of the conger, giving the results of experiments and observations made by means of the aquarium in the two years 1889 and 1890. This is by far the most exhaustive investigation yet made on the subject, and brings to light several important and surprising facts concerning the history of the conger. The observations show that there is normally an enormous difference in size between the male and female conger, the male never exceeding two feet six inches in length ; that, whereas the male becomes ripe in the aquarium, the female invariably dies in captivity before shedding her ova ; that the female ceases altogether to take food for five or six months while the ovaries are ripening ; that both males and females only breed once in their lives, dying after shedding the reproductive product, etc., etc. Mr. Cunningham's second paper, on some larval stages of fishes, describes and figures several stages of the young sole and mackerel previously unknown.

The second number for 1890 contains a description of experiments on the production of artificial baits, by Mr. William Bateson, M.A., of Cambridge, especially employed on this investigation by the Council of the Association ; also papers on the statistics of the herring, long-line, and pilchard fisheries, and some physical investigations on temperature and density of the sea. Mr. Cunningham has five papers ; the most important are those on the rate of growth of sea fishes, and the reproduction and growth of the pilchard. The first paper refers to trawl-fishes, and contains the first reliable evidence of any importance ever obtained as to the rate of growth of some of our most important marine food-fishes. The Scottish Fishery Board had made some attempt to investigate this question by marking fish, returning them to the sea, and comparing their size when recaptured. But the attempt had failed. Mr. Cunningham's method was to rear fish-fry obtained from the sea, evidently of the same season's spawning, in the aquarium tanks, and to compare the actual growth of these with that deduced from measurements of specimens captured in sea at various times of the

year. Among the species successfully reared in the aquarium were the flounder, the brill, the grey mullet, and the rockling. The most extensive experiments were made with the flounder. It was shown that none of the specimens reared became sexually mature at one year old, and that the sizes of individuals spawned in one season varied between very distant extremes. In his paper on the pilchard, Mr. Cunningham describes the alevins captured out at sea in July. He also describes the larvæ of the rock lobster (*Palinurus vulgaris*), the object of an important fishery on the south coast, whose larvæ had previously been only occasionally taken singly, while Mr. Cunningham took them in hundreds.

1891-92.—In the Tenth Annual Report of the Scottish Fishery Board, published in 1892 and relating to 1891, much space is as usual occupied by the tables of records of the statistical observations made by means of the *Garland* and otherwise. The trawling experiments of the *Garland* showed again a considerable decrease in the abundance of food-fishes in the waters of the Firth of Forth and St. Andrew's Bay, closed against beam-trawling. Following are extracts from Dr. Fulton's remarks:—"It is clear from the analysis of the results of the trawling experiments since 1886, that the prohibition of beam trawling within the Firth of Forth and St. Andrew's Bay has not been followed by the increase in the abundance of flat fishes within these waters which was anticipated." As an explanation it is pointed out that the spawning fish do not spawn in the protected waters, but are on the other hand captured outside by the trawlers; and that immature fish of the majority of species are to be found in greatest numbers outside the territorial limit up to a distance of 10 or 12 miles from shore. In the same Report Dr. Fulton has an interesting paper on the decrease in the supply of fish, and the remedies for it, especially in relation to sea-fish propagation and culture. In 1891 it was decided by the Board that a sea-fish hatchery should be erected and organised at Dunbar, similar to the hatchery of Captain Damnevig at Flödevig, Arendal, Norway. Dr. Fulton went to examine the arrangements at Flödevig, and the construction of the establishment at Dunbar was commenced. The whole of the expenditure has been met from the ordinary Government grant to the Scotch Board for scientific investigations, but an additional £1500 is asked from the Treasury in order to enclose

creeks and convert them into sea-ponds. In the previous year, 1890, a lobster pond was constructed at Brodrick Bay, Arran, and stocked with berried lobsters, and in 1891 it is stated that about 200,000 lobsters' ova were hatched there. The Report contains two other papers of some importance, namely, "Observations on the Reproduction, Maturity, and Sexual Relations of the Food Fishes," by Dr. Fulton, and further "Contributions concerning Life Histories and Development," by Professor McIntosh. The latter contains observations on the eggs of the halibut, first discovered to be pelagic by Mr. Holt, and on the eggs of the megrim (*Arnoglossus megastoma*), torsk, &c.

The work performed by the staff of the Marine Biological Association in 1891 and 1892 is described in four numbers of the Journal published in those years. A number of scientific papers resulting from researches made at the Plymouth Laboratory have in addition been published in various scientific periodicals. It should be borne in mind, in comparing the work of this Association with that of the Scottish Fishery Board, that its total annual revenue has been from £1,000 to £1,500, and that it has not been possible to devote more than half of this to fishery investigations, or to employ the services of more than one investigator—namely, Mr. J. T. Cunningham in that department—until 1891, when by aid of a special donation from Mr. J. P. Thomasson of £250, the services of Mr. E. L. Holt were also secured. Other workers at Plymouth have made studies of oysters, lobsters, etc., for greater or less periods. The part performed by the Association in the progress of biological science generally in the country is at least as important as its fishery branch. On the other hand, the much larger Government funds at the disposal of the Scotch Fishery Board have been entirely devoted to fishery investigations.

In the beginning of 1891 Mr. E. W. L. Holt, who did such good work in the survey on the west coast of Ireland, entered the service of the Marine Biological Association, being appointed to investigate the distribution and destruction of immature fish in the North Sea. He was stationed at Grimsby, where the local Marine Fisheries Society placed their small but useful establishment at his disposal.

In the number of the *Journal of the Marine Biological Associa-*

tion issued in May, 1892, the commencement of Mr. Holt's observations are described, the continuation of the experiments on artificial baits, now taken up by a chemist Mr. Hughes, and further physical observations are recorded by Mr. Dixon. It contains also the continuation of Mr. Cunningham's research upon the rate of growth of bottom fishes. This paper comprises a criticism of the conclusions of other observers as to the rate of growth of certain fishes, such as the anchovy and the pilchard. The flounders reared at Plymouth were alive and healthy in the spring of 1892, and some of them then became sexually mature and actually spawned, while many were still immature. Young mackerel and pilchards estimated to be about one year old had been obtained in special nets used for anchovies, and the sizes of these are recorded and discussed. Mr. Cunningham shows by collation of all the evidence that it tends to the conclusion that marine fishes, whether flat fishes, or migratory fishes like the herring or mackerel, do not spawn till they are two years old at least; while many are older than this before they begin to breed; the same was known to be true of the salmon long ago.

The most important contributions in the last issued number of the *Journal* refer to Mr. Holt's enquiries in the North Sea. His paper chiefly consists of a careful consideration of the evidence he has obtained as to the size at which the most valuable species of flat fish in the North Sea become mature. In Mr. Cunningham's papers this has been determined for several species at Plymouth, and the results in the two districts differ considerably, a fact which constitutes one of the chief difficulties which will have to be faced in framing restrictive legislation as to the capture of undersized fish. Mr. Holt has made an extensive collection of the very small fish of valuable forms captured by shrimp nets in the Humber, and by other means; and Mr. Cunningham reports upon the probable ages of these—a report which adds considerably to our general knowledge of the movements and habits of the bottom food-fishes. In another paper Mr. Cunningham describes additional stages in the development of the sole and mackerel.

The possibility of establishing a fishery for anchovies in the English Channel has engaged the attention of the Council of the Marine Biological Association. In 1890, single specimens of the

anchovy were reported as having been captured by the sprat-fishermen of Deal and Dover. Mr. Cunningham was directed to enquire into the occurrence of anchovies on the south coast, and published an account of the matter in the Journal of the Association. It appears that anchovies are taken in small numbers in autumn every year in drift-nets and in larger quantities by sprat-seiners at Torquay. The Council of the Association has obtained special drift-nets with small meshes for the purpose of prosecuting this fishery, but its *employés* at Plymouth have not yet succeeded in catching more than an insignificant number of the fish. However, in consequence of the publicity given to the subject, some barrels of anchovies have been sent from Torquay to be preserved at Mevagissey, whereas formerly they were not separated by the fishermen from sprats. A difficulty in this matter consists in finding persons with a knowledge of the approved method of "curing" anchovies, and another in the unwillingness of the regular dealers in anchovies to admit those from a new source to the market.

In this investigation, as in all its fishery work, the Marine Biological Association is at a disadvantage in not having funds to purchase and maintain a steam-trawler such as the *Garland*, provided by Government funds for the Scotch Fishery Board. On the other hand, the foundation funds of the Association have been expended on the building and equipment of a fine laboratory, with library, aquarium with large tanks, reservoirs and circulating sea-water supply, and a large part of its annual revenue is employed in the maintenance of that establishment for the benefit of zoological investigators. It seems to be in the highest degree desirable that the necessary steamship and funds for its maintenance should be placed at the disposal of the Association.

In the preparation of the foregoing report on the progress of scientific research in relation to our sea fisheries I have been materially aided by abstracts of the various official publications kindly furnished to me by Mr. Cunningham, naturalist on the staff of the Marine Biological Association of the United Kingdom.

APPENDIX A.

List of Researches in connection with FISHERY PROBLEMS, carried out by the Staff of the Marine Biological Association, and published by the Association in the six years 1887 to 1892 inclusive.

- A Treatise on the Common Sole (*Solea vulgaris*) considered both as an organism and as a commodity. Prepared for the Marine Biological Association of the United Kingdom. By J. T. Cunningham, M.A., F.R.S.E., late Fellow of University College, Oxford; Naturalist to the Association. Plymouth. Published by the Association. 1890. (Quarto, pp. 147, with eighteen plates, twelve coloured).
1. Notes on the Fishing Industry of Plymouth. By Walter Heape, M.A. Journal (of the M.B.A.) No. I. August, 1887.
 2. Preliminary Enquiry at Plymouth into the Marine Fauna and Ova of Fishes. By J. T. Cunningham, B.A. Journal No. II. August, 1888.
 3. The Habits of the Cuckoo Fish; the Breeding of the Conger; the Spawn of the Pilchard; the Reproductive Organs of the Common Sole. By the Same (*ibid.*).
 4. The Sense Organs and Perceptions of Fishes; with Remarks on the Supply of Bait. By W. Bateson, M.A. Journal, new series, vol. i. 1889-90.
 5. The Fisheries and Fishing Industries of the United States; Report of a Trawling Cruise off the South-west Coast of Ireland. By G. C. Bourne, M.A. Journal, new series, vol. i. 1889-90.
 6. Studies on the Reproduction and Development of Teleostean Fishes occurring in the Neighbourhood of Plymouth. By J. T. Cunningham, M.A. Journal, new series, vol. i. 1889-90.

7. The Vernacular Names of Common Fishes. By the Same (*ibid.*).
8. Anchovies in the English Channel. By the Same (*ibid.*):
9. Colour Changes in *Cottus Bubalis*. By the Same (*ibid.*):
10. The Fish Pot of the Caribbean Sea. By E. M. Earle (*ibid.*).
11. Notes on Oyster Culture. By G. H. Fowler (*ibid.*).
12. Relation between Temperature and Annual Catch of Anchovies in the Schelde District. By the Same (*ibid.*).
13. On Oyster Culture. By Lord Montagu, of Beaulieu (*ibid.*).
14. The Mackerel Fishery in the West of England in 1888. By B. J. Ridge. Vol. i, new series, 1889-90.
15. Notes on the Herring, Long-line, and Pilchard Fisheries of Plymouth during the Winter 1889-90. By W. Roach (*ibid.*).
16. The Plymouth Mackerel Fishery of 1889-90. By W. L. Calderwood. Vol. ii. 1891-92.
17. The Lobster-fishing of One Boat in the Plymouth District, from May 1st to September 29th, 1890 (*ibid.*).
18. The Reproduction and Development of the Conger. By J. T. Cunningham, M. A. (*ibid.*).
19. On Some Larval Stages of Fishes. By J. T. Cunningham, M.A. (*ibid.*).
20. Grayling and Loch Leven Trout in Salt-water (*ibid.*).
21. The Egg and Larva of *Callionymus Lyra*. By J. T. Cunningham (*ibid.*).
22. Experiments on the Production of Artificial Baits. By Frank Hughes (*ibid.*).
23. The Rate of Growth of some Sea-fishes, and their Distribution at different Ages. By J. T. Cunningham (*ibid.*).

24. On the Development of *Palinurus vulgaris*, the Rock-Lobster or Sea Crayfish. By the Same (*ibid.*).
25. The Reproduction and Growth of the Pilchard. By the Same (*ibid.*).
26. The Distribution of *Crystalligobius Nilsson.* By the Same (*ibid.*).
27. Physical Investigations and Notes on Meteorological Observations at Plymouth. By H. N. Dickson (*ibid.*).
28. Notes on the Herring, Long-line, and Pilchard Fisheries of Plymouth (*continued*). By William Roach (*ibid.*).
29. North Sea Investigations. By Ernest W. L. Holt (*ibid.*).
30. Further Experiments on the Production of Artificial Bait. By Frank Hughes (*ibid.*).
31. On the Rate of Growth of some Sea-fishes, and the Age and Size at which they begin to Breed. By J. T. Cunningham (*ibid.*).
32. On some Young Specimens of *Centrolophus pomphilus* (Art.) from the Coast of Cornwall. By E. W. L. Holt (*ibid.*).
33. Experiments on the Relative Abundance of Anchovies off the South Coast of England. By W. L. Calderwood (*ibid.*).
34. Report on Physical Investigations (1891-92). By H. N. Dickson (*ibid.*).
35. A Contribution to the Knowledge of the Ovary and Intra-ovarian Egg in Teleosteans. By W. L. Calderwood (*ibid.*).
36. On *Centrina Salviani*. By the Same (*ibid.*).
37. Ichthyological Contributions. By J. T. Cunningham (*ibid.*).
38. Report on the Probable Ages of Young Fish collected by Mr. Holt in the North Sea. By J. T. Cunningham (*ibid.*).
39. Monthly Reports on the Fishing in the Neighbourhood of Plymouth. By W. L. Calderwood (*ibid.*).

40. *Polyprion cernium* (the Stone Basse or Wreck-fish). Vol. By W. L. Calderwood (*ibid.*).
 41. Later Larval Stages of Mackerel; the Ova of the Halibut; the Ova and Later Larval Stages of the Turbot. By E. W. L. Holt (*ibid.*).
 42. Year-old Pilchards. By J. T. Cunningham (*ibid.*).
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APPENDIX B.

List of Researches on MARINE ZOOLOGY AND BOTANY, carried out in the Plymouth Laboratory of the Marine Biological Association, and published either in the Journal of the Association, or in other scientific periodicals, during the six years 1887-1892.

1. Preliminary Report upon the Fauna and Flora of Plymouth Sound. By Walter Heape, M.A. Journal No. II., August, 1888.
2. Notes on the Senses and Habits of some Crustacea; Sense of Touch in the Rockling; Sudden Colour-changes in Conger; Contractility of the Iris in Fishes and Cephalopods; Modes in which Fish are Affected by Artificial Light; Sound heard by a Lamellibranch. By W. Bateson, M.A. Journal, New Series, vol. i., 1889-90.
3. Notes on the Marine Oligochaeta of Plymouth. By F. E. Beddard. Journal, New Series, vol. i., 1889-90.
4. On a Tornaria found in British Seas; On the Pelagic Copepoda collected at Plymouth in 1888-89; on the Generative Organs of the Oyster; on the Surface Collections made by Mr. Grenfell in the North Sea and West of Scotland; on the Hydroids of Plymouth Sound. By G. C. Bourne, M.A. Journal, New Series, vol. i. 1889-90.

5. On *Tealia tuberculata*. By J. T. Cunningham, M.A. (*ibid.*).
6. Report on the Nudibranch Mollusca of Plymouth Sound; a Complete List of the Opisthobranchiate Mollusca found at Plymouth, with Observations on their Morphology and Natural History. By Walter Garstang, M.A. (*ibid.*).
7. On the Anatomy of *Dinophilus*. By S. F. Harmer, M.A. (*ibid.*).
8. The Flora of Plymouth Sound. By T. Johnson (*ibid.*).
9. Notes on some Animal Colouring Matters. By C. A. MacMunn (*ibid.*).
10. On *Delesseria sanguinea*. By M. C. Potter (*ibid.*).
11. The Function of the Electric Organ of the Skate. By J. Burdon Sanderson and F. Gotch (*ibid.*).
12. *Halosphœra viridis*. By H. Thompson (*ibid.*).
13. The Cœlom and Nephridia of *Palæmon serratus*. By W. F. R. Weldon. Vol. i., New Series, 1888-89.
14. Note on the Function of the Spines of the Crustacean Zoœa. By the same. (*ibid.*)
15. The Head-Kidney of Teleostean Fishes. By W. L. Calderwood. (*ibid.*)
16. Report on the Tunicata of Plymouth. By Walter Garstang, M.A. (*ibid.*).
17. Hermit Crabs and Anemones. By G. H. Fowler (*ibid.*).
18. Phoronis at Plymouth. By Walter Garstang (*ibid.*).
19. Ray's Bream. By J. T. Cunningham (*ibid.*).
20. Note on a British Cephalopod, *Illex Eblanæ* (Ball). By W. E. Hoyle, M.A. (*ibid.*).

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21. The Occurrence of the Nudibranch Hancockia at Plymouth.
By F. W. Gamble (*ibid.*).
22. *Saphenia mirabilis* Hæckel. By J. T. Cunningham (*ibid.*).
23. *Pleurophyllidia Loveni*, Bergh. By the Same (*ibid.*).
24. On a Species of Siphonophore observed at Plymouth. By J. T. Cunningham (*ibid.*).
25. A New British Nemertine. By T. H. Riches (*ibid.*).
26. Note on a Large Squid (*Ommastrephes pteropus*, Stp.). By E. S. Goodrich (*ibid.*).
27. Notes on the Marine Invertebrate Fauna of Plymouth, made during the Year 1892. By Walter Garstang, M.A. (*ibid.*).
28. Notes on the Plankton observed at Plymouth during the Summer, 1892. By E. J. Bles (*ibid.*).
29. *Muggiæa Atlantica*. By J. T. Cunningham (*ibid.*).
30. The Variations occurring in Certain Decapod Crustacea. By W. F. R. Weldon. Proc. Roy. Soc., xlvii.
31. Certain Points in the Structure of Clitellio. By F. E. Beddard. Proc. Zool. Soc. 1888.
32. On Some British Species of Pachydrilus. By the same. Proc. Roy. Phys. Soc., Edinburgh. 1889.
33. On Secondary Sexual Characters in Arnoglossus. By J. T. Cunningham. Proc. Zool. Soc. 1890.
34. Dictyopteris: Remarks on the Systematic Position of the Dictyotaceæ. By Prof. T. Johnson. Journ. Linn. Soc. 1890.

35. Observations on Brown and Red Sea-weeds. By Prof. T. Johnson. Rep. Brit. Assoc. 1890.
36. Contributions to Animal Chromatology. By C. A. MacMunn. Quart. Journ. Micr. Sci., vol. xxx. 1890.
37. The Nephridium of Lumbricus, with Remarks on the Nephridia of other Chætopods. By W. B. Benham. Quart. Journ. Micr. Sci., vol. xxxii.
38. On Some Disputed Points in Teleostean Embryology. By J. T. Cunningham. Ann. and Mag. Nat. Hist. 1891.
39. An Experiment Concerning the Absence of Colour from the Lower Sides of Flat Fishes. Zoologischer Anzeiger. 1891.
40. Tektonische Studien an Hydroidpolypen. By Hans Driesch. Jenaische Zeitschrift, vols. xxiv. and xxv.
41. Note on a New and Primitive Type of Compound Ascidian. By W. Garstang. Ann. and Mag. Nat. Hist. 1891.
42. On the Action of Nicotine on Certain Invertebrates. By M. Greenwood. Journ. Physiol., vol. xi.
43. On the British Species of Crisia. By S. F. Harmer. Quart. Journ. Micr. Sci., vol. xxxii.
44. On the Occurrence of Embryonic Fission in Cyclostomatous Polyzoa. By S. F. Harmer. Quart. Journ. Micr. Sci. vol. xxxiv.
45. Note on a Sieve-like Membrane across the Oscula of a Species of Leucosolenia. By E. A. Minchin. Quart. Journ. Micr. Sci., vol. xxxiii.
46. Observations on the Gregarines of Holothurians. By E. A. Minchin. Quart. Journ. Micr. Sci., vol. xxxiv.

47. Studies on the Protochordata. By Arthur Willey. Quart. Journ. Micr. Sci., vol. xxxiv.
48. On the Regeneration of Lost Parts in the Polyzoa. By S. F. Harmer. Rep. Brit. Assoc. 1890.
49. Observations on the Phæozoosporeæ. By Prof. T. Johnson. Ann. Bot., vol. v.
50. The Callosities of *Nitophyllum versicolor*. By Prof. T. Johnson. Journ. Roy. Dublin Soc. 1892.
51. The Air-Bladder and Ear of British Clupeoid Fishes. By W. G. Ridewood. Journ. Anat. and Physiol., vol. xxvi.
52. On the Nauplius Eye persisting in some Decapoda. By M. Robinson. Quart. Journ. Micr. Sci., vol. xxxiii.
53. The Renal Organs of Certain Decapod Crustacea. By Professor Weldon, F.R.S. Quart. Journ. Micr. Sci., vol. xxxii.
54. The Formation of the Germ-layers in *Crangon vulgaris*. By Professor Weldon, F.R.S. Quart. Journ. Micr. Sci., vol. xxxiii.
55. The Minute Structure of the Gills of *Palæmonetes varians*. By Edgar J. Allen. Quart. Journ. Micr. Sci., vol. xxxiv.
56. On Some Points in the Histology and Development of *Myriothela Phrygia*. By W. B. Hardy. Quart. Journ. Micr. Sci., vol. xxxiv.
57. The Nephridia and body-cavity of some Decapod Crustacea. By Edgar J. Allen. Quart. Journ., Micr. Sci., vol. xxxiv.
58. A Monograph of the British Marine Planarians. By W. F. Gamble. Quart. Journ., Micr. Sci., vol. xxxiv.

ANGLING.

By R. B. MARSTON (Editor of *The Fishing Gazette*).

Very pleasant is it for an Englishman who for many years has watched the progress of field-sports in America, as chronicled in the columns of *Forest and Stream*, *Shooting and Fishing*, *The American Angler*, *The American Field*, &c., to note the strong and universal hold which the sport of angling has in the affections of the American people. Hanging on the walls of my fishing library are fine old contemporary engravings of two noted anglers—one was the saviour of the old world, the other of the new—Nelson and Washington. A matter of congratulation to us anglers also is it that the present twice-elected President of the United States is an enthusiastic angler, as is also his charming wife.

One of the beauties of angling is the very wide range and variety of sport it offers. If you court sport with danger, the noble salmon, from the ice-cold torrents of the northern rivers, invites you to test your best strength with him. There, as bracing yourself waist-deep against the rushing waters, against the gale of sleet and hail which sweeps down the gorge from the snow-clad mountains—there, after many a cast with your eighteen-foot salmon-rod, which the north wind treats like a reed, now bending it back on you, now dashing the rough leader across your face like a whip-lash—there, out in the midst of the foam and waves, a great flash of silver catches your eye. It is the monarch of the stream: he has accepted your invitation to battle; and to defeat him will tax every resource at your command, aided as he is by the stress of water and weather, by the sunken rocks and slippery boulders among which you must follow him, or the still more dangerous quicksand.

Or, on a warm summer evening, as your boat drifts over the lake before the refreshing breeze, you may almost without effort cast the taper line, gossamer gut collar, and dainty flies, across the path of the advancing trout, and then admire the graceful curve of your trusty split-cane, greenheart, lancewood, or other favourite old rod, as it bends to the rush of the game fish.

What is this great World's Fair? In one respect it may be said to be a picture of the myriad ways which the human mind has devised

to accumulate riches, in order therewith to obtain ease, leisure, and enjoyment of life and the pleasure of going a-fishing. Anglers from all parts of the world will flock to Chicago as a grand excuse for testing the angling capabilities of the rivers and lakes of North America; and at Chicago they will see the finest exhibition of everything connected with fish, fishing, and fish-culture that has ever been brought together. To them most directly interesting will be the Angling Department, under the special care of one of the leading anglers of America, Dr. James A. Henshall, author of 'The Book of the Black Bass,' &c., whose motto on his title-page is this line from Walton :—

“I am, sir, a brother of the angle.”

Many an English and American angler, who may have had the pleasure of meeting the doctor or of reading his books, will hope to meet him again before he disperses the grand exhibit he has so lovingly collected together. It will be a matter of regret to him and to other leading American anglers—such as Mr. A. Nelson Cheney, Mr. Henry P. Wells, Mr. Fred. Mather, Mr. Charles Hallock, Mr. Wm. Harris, &c.—that British and Irish manufacturers of rods, reels, lines, flies, baits and angling requisites generally, are conspicuous only by their almost entire absence. All honour to the few British firms who, in the face of adverse tariffs, have had the courage to compete at Chicago. If it had not been for the heavy duty, which handicaps so severely our manufacturers of fishing tackle, it is pretty certain that they would long ago have been found competing with even the best makers of America.

Twelve or fifteen years ago no British firm could compete with the best makers of one particular description of rod, viz., the hexagonal split cane. These beautiful rods were imported at first in small quantities, chiefly by one or two West-end gunmakers, and sold at exorbitant prices; or now and then English sportsmen returning from the States brought these new rods with them. They were received with that national prejudice which leads us at first to under-rate a thing and then to run to the other extreme of over-rating it, making a fashion of it; the great demand then caused a large number of utterly worthless built-cane rods to be made for this market, bringing discredit on a style of rod which, if properly made, has in many

respects no superior. Fortunately for English anglers, one English firm—Messrs. Hardy Brothers, of Alnwick, Northumberland—went heart and soul into the manufacture of built-cane rods. Being gun-makers as well as rod-makers, and anglers as well, they, after some years of patient experiment, were able to produce rods which ten years ago, at the International Fisheries Exhibition, London, were pronounced to be second to none. Split-cane rods were, indeed, exhibited by Messrs. Aldred & Co., of Oxford Street, as long ago as the first International “World’s Fair”—that of 1851. They were made of triagonal slips of cane glued together, and rounded on the outside so as to appear like an ordinary hard wood rod. They are good rods, and Lord Lovat possessed one for many years, with which he killed tons of salmon.

Although built-cane rods, like built-cane cricket-bat handles, are undoubtedly an English invention, comparatively very few were made in this country until American rod-makers improved them by making them hexagonal, thus keeping all the hard enamel on the outside of the rod, and, by using machinery in their manufacture, securing the necessary uniformity in size of the sections used in making up each joint—a very expensive, tedious, and uncertain process when done by hand.

In Great Britain and Ireland, in our colonies, in India, in Canada, in fact all over the world where angling can be practised by our countrymen, the built-up cane rod is used and most highly appreciated; and for this we have chiefly to thank those celebrated American rod-makers, Mitchell and Leonard. For all this, it cannot be said that with us the built-cane is the prime favourite, as it is in America. The majority of our anglers still prefer, for most kinds of fishing, rods made of greenheart; and it is fortunate that an exhibit from such first-class makers as Messrs. Forrest and Sons, of Kelso-on-Tweed, represents British-made rods of this description both for salmon and trout fishing, as well as salmon and trout flies.

We should have been glad for our American friends to have had the chance of examining hard wood rods made by such makers as Farlow and Co., Hardy, Malloch, Anderson, Braddell, Rogan, Foster, Enright, and many others; also specimens of the splendid reels made in this country for salmon, trout, and general fishing, and especially for spinning.

It is a somewhat curious fact that, although "spinning from the reel" is a very favourite method of fishing both in this country and in America, the reels used and the methods of using them are quite different. By "spinning from the reel" is meant casting a spinning bait from twenty to fifty, and in some cases eighty, yards by allowing the line to run off the reel, carried by the bait, which has been propelled through the air by a more or less vigorous swing of the rod. Without illustrations it is somewhat difficult to describe this very fascinating method of fishing in a few words. Everyone knows what a revolving crane for loading and unloading railway trucks, ships, etc., is like. Suppose the angler to be the body of the crane, the long arm the rod, and the chain and windlass the reel and line. The angler winds his bait up to within a foot or so of the point of the rod, just as the weight to be lifted is wound up near to the end of the arm of the crane. Now suppose the crane, instead of being turned on its axis slowly, is made to revolve rapidly for half a circle, and then suddenly stopped and the drag taken off the chain. The natural result would be that great momentum would be given to the weight suspended from the chain, and when the arm of the crane was stopped the weight would fly off to a considerable distance, carrying the chain after it.

This is the whole principle of "spinning from the reel"; and whether it is done from a light English "Nottingham" reel, or from an American "Frankfort," "Van Hofs," or "Imbrie" metal multiplying reel, requires very considerable skill to accomplish successfully. By the way, Dr. Henshall is quite mistaken in his description of what he, on p. 250 of the 1881 edition of his "Book of the Black Bass," calls "the Nottingham style of fishing." He says that in this style, "much in vogue in England," the angler coils a lot of line off the reel on the ground, lets twelve or fifteen feet of the line hang from the top of the rod, takes hold of the line a few feet from the sinker and "*gives it a few rapid whirls about his head*, and then casts it as far as he can, the rod in the meantime being held firmly in the left hand." No wonder he adds that "to an expert angler such a game would not be worth the candle." An English angler who knows the charm which the use of the light free-running Nottingham reel affords will look upon the genial Doctor's description as one of the best fish stories we have had even from America. As a matter

of fact, the present writer never saw any angler in any part of Great Britain or Ireland whirl a spinning bait round his head with one hand while holding the rod with the other, or indeed cast a bait in this way at all.

In what is known as the "Thames" style of casting a spinning bait, the angler pulls line off the reel and coils it at his feet in the fishing punt or boat, or on the bank; then giving the bait suspended near the rod-point a swing with the rod and releasing the line, the bait flies off in the direction intended, carrying the line after it, just as a rocket carries a line from the shore to a ship.

Many of our best anglers use both styles, and both have special advantages. The light, large barrel of the "Nottingham" reel, made of vulcanite or well-seasoned wood, revolves on a fine steel spindle, with which it is only in contact at two points, which are kept well oiled to reduce the friction to a minimum. A good Nottingham reel of $4\frac{1}{2}$ -in. or 5-in. diameter and 2-in. width will continue to revolve for two or even three minutes when held in the hand or standing on a table simply from the impetus given by one or two quick strokes with the hand on the rim of the revolving part, or by pressing and suddenly releasing the handle. About the year 1882 Mr. David Slater, of Newark-on-Trent, invented what is known as Slater's "Combination" Nottingham and ordinary reel. In this beautiful reel, the barrel which holds the line revolves inside a brass frame with side bars, and when the "check" is brought into action, the reel is to all intents and purposes an ordinary fishing reel; but touch the check spring again, you have a very strong and yet delicately-adjusted barrel, which on the least pull of the line will fly round like the fly-wheel of an engine. All the best Nottingham reels have a "check" action, and all have two ivory or vulcanite handles placed opposite each other on the outside edge of the revolving reel. One handle balances the other, just as in the American German silver or brass multiplier you must have the balanced handle—which to an English angler looks a very dangerous line catcher. The two handles on the Nottingham reel, being in shape like thimbles, and sitting close on the smooth side of the reel, never catch the line.

The English angler controls the run of the Nottingham reel, so as to prevent over-running, by the gentlest pressure of the finger-tips on the smooth rim of the revolving barrel or spool; the American

angler has to use a thumb-stall, as the thumb is pressed gently on the body of the line on the spool, just behind the point where the line is leaving it, the reel being on the upper side of the rod. This causes very great friction, especially where heavy baits and sinkers are used. More force is required to make this multiplier revolve than is required by a plain Nottingham reel.

In America undressed, fine, braided linen lines appear to be preferred for casting from the reel; in England we prefer very fine, undressed, plaited silk lines.

It would be very interesting if a match could be arranged at the World's Fair between English experts in the "Nottingham" style of casting a bait from the reel and American experts in the American style, conditions as regards length of rods and weights thrown, etc., to be made as equal as possible, the sole object being to see which style permits of the greatest accuracy, delicacy, and length of cast.

It would be additionally interesting if one or two of our "Thames" style expert casters could be present; and then it would most probably be proved that for accuracy, delicacy, and distance the Thames style would be ahead. It is clear that the bait which, when flying through the air, has only a line to pull after it must require less force than one which has to pull a reel round also. It is the starting of the reel which requires force unnecessary in the "Thames" style, the one great drawback to which is that you must have a clear space on which to coil the line—naturally to coil it at your feet among brambles, or thistles, or drift-weed is to ensure a tangle. To overcome this difficulty some of our best men carry in front of them a light shallow wicker basket or fine-meshed fan-shaped folding net-tray, fastened to the left side, rather to the front. The line is coiled into this, and you can use it wading, and can cast a minnow an inch long with merely a bit of lead in it the size of a barleycorn to any reasonable fishing distance.

In other branches of angling, though not to the same extent as in spinning from the reel or otherwise, British and American anglers may learn much from each other; and it is sincerely to be hoped that the great World's Fair of 1893 will do much to increase that spirit of good feeling and good fellowship which already exists between the English-speaking anglers on both sides of the Atlantic—a feeling which is charmingly alluded to in the most important

recent contribution to angling literature, viz., "Favourite Flies," by Mrs. Mary Marbury Orvis, of Manchester, Vermont, U.S.A.

Who shall say what influence on the side of peace this common bond of brotherhood between British and American anglers may have, if—which Heaven forbid—at some future time the two nations again look with anger at each other?

DEPARTMENT D.

FISH, FISHERIES, FISH PRODUCTS, AND APPARATUS OF FISHING.

*Unless otherwise stated, the Exhibits in this Department are in the
Fisheries Building.*

GROUP XXXVIII.

SEA FISHING AND ANGLING.

90 Anderson-Smith, William, *Ledaig, Scotland.*

Literature of sea fishing and marine productions.

91 Baltimore School of Fishery, *Co. Cork, Ireland.*

Model of the school; model of one of the school fishing smacks
(1st class); samples of cured mackerel.

92 Buchanan, James, 62, *Dale Street, Tradeston, Glasgow.*

Deep sea fish hooks and tackle.

93 Rollit, Sir Albert, *Dunster House, Mark Lane, London, E.C.*

Model of a steam trawler.

[Transp. B]

Anderson, Anderson, & Anderson. *See GROUP XXXIX.*

Barbour & Sons, Limited, William. *See GROUP CII.*

Belfast Ropework Co., Limited. *See GROUP LXXXV.*

Combe, Barbour, & Combe, Limited. *See GROUP IX.*

Finlayson, Bousfield & Co. *See GROUP CII.*

Milward & Sons. *See GROUP CVI.*

Turner & Sons. *See GROUP CVI.*

GROUP XXXIX.

FRESH WATER FISHING AND ANGLING.

- 95 Anderson, Anderson, & Anderson, 37, *Queen Victoria Street, E.C., and (works) Bow, E., London.* [See Advt.]

Fishermen's waterproofs for river, loch, and sea fishing, "Buckland" combination waders (stockings and brogues in one, with regd. test soles), Cholmondeley-Pennell (regd.) over-knee waders, "Norge" (regd.) semi-waders, leather-lined pure rubber knee and thigh boots, salmon and trout waders, brogues, bags.

- 96 Bartleet & Sons, William, *Abbey Mills, Redditch.*
Fish hooks.

- 97 Stanley, Edward, 19 *Disbrowe Road, West Kensington, London.*
Lobster trap and eel trap.

- 98 Turnbull, William, 60 *Princes Street, Edinburgh.*
Feathers used in making of salmon flies.

Barbour & Sons, Limited, William. See GROUP CII.

Belfast Ropework Co., Limited. See GROUP LXXXV.

Combe, Barbour, & Combe, Limited. See GROUP IX.

Finlayson, Bousfield & Co. See GROUP CII.

Milward & Sons. See GROUP CVI.

Turner & Sons. See GROUP CVI.

GROUP XL.

PRODUCTS OF THE FISHERIES AND THEIR MANIPULATION.

- 99 Allies, Cyril, *Inis Boffin, Co. Galway.*
Connemara dried ling.

- 100 Corner, A. & J. Q., *Wick, Scotland.*
Cured fish

101 Macfarlane Brothers, 17 *Kenneth Street, Stornoway.*

Cured fish.

See also exhibits in GROUPS VI., XVII., and XLVIII.

Baltimore School of Fishery. *See* GROUP XXXVIII.

GROUP XLI.

FISH CULTURE.

Marine Biological Association of the United Kingdom. *See*
GROUP CLV.

Johnson, Matthey & Co., Limited,

HATTON GARDEN, LONDON.

PLATINUM MANUFACTURERS.

Highest Awards at the International Exhibitions of 1851, 1855, 1862, 1865, 1867, 1873, 1878, 1889, for products and manufactures of Platinum and the Precious Metals.

SPECIAL AWARDS AT THE PARIS EXHIBITION OF 1878.
ESTIMATED VALUE OF EXHIBIT, 2,500,000 FRANCS.

CLASS 43. "THE GRAND PRIX." Highest Award.	}	For progress in the metallurgy of Platinum and its associated Metals, and in the production of Iridio-Platinum and other Alloys.
CLASS 53. "THE GRAND PRIX." Highest Award.		For perfection in Platinum manufactures and for marked improvements in Platinum Apparatus for chemical purposes—specially for the concentration of Sulphuric Acid.

In the Paris Exhibition, 1867, JOHNSON, MATTHEY & Co. exhibited Platinum Apparatus, Rare and Precious Metals, and Chemical Preparations of the value of 500,000 frs., and were (as also subsequently in VIENNA) the ONLY manufacturers of Platinum to whom the HIGHEST AWARDS were made in EACH OF THE THREE CLASSES under which they exhibited.

CHICAGO, 1893.

Exhibits of Improved Platinum Apparatus, for the concentration of Sulphuric Acid.

Gold-lined Platinum Apparatus, as manufactured in 1855.

Series of Platinum Apparatus, for the concentration of Sulphuric Acid, showing some of the various forms introduced by the firm since the first boiler manufactured for this purpose in 1809.

Platinum Wire, Sheet, Crucibles, Tubes, &c.

Series of Metals of the Platinum group : IRIIDIUM, OSMIUM, RHODIUM, RUTHENIUM, PALLADIUM.

Alloys of Iridium and Platinum, Rhodium and Platinum, Platinum and Silver, Palladium and Silver, &c., &c.

Standard Metre and Kilo. IRIIDIUM, 10 per cent., PLATINUM, 90 per cent., as furnished to the French International Commission. Density 21.552.

Purity of Platinum (about 8,000 ozs.), prepared for these standards, shown by the analyses of MM. St. Claire Deville and Debray, of Paris, and Mons. Stas, of Brussels, to be 999.98773 per 1,000 parts,

Department E.

MINES, MINING, AND METALLURGY.

MINING.

BY C. LE NEVE FOSTER, D.Sc., F.R.S.,

H.M. Inspector of Mines, and Professor of Mining, Royal College of Science.

Considering its size, the United Kingdom of Great Britain and Ireland may be fairly regarded as a country richly endowed with mineral wealth, and mining is not only one of its most important, but also one of its most ancient industries. Indeed, long before the Phœnicians came to Cornwall for tin, the men of the Neolithic period sank pits in the chalk and burrowed for flints by true underground mining processes.

The principal scene of the miner's labours in Great Britain has changed from time to time. For instance, the Weald of Kent and Sussex no longer supplies charcoal furnaces with clay ironstone, a mineral which is losing its importance even in other districts ; but, on the other hand, new sources of wealth have been tapped in comparatively recent times by working the ironstone of Cleveland and central England, the salt bed at the mouth of the Tees, and the oil-shale of Scotland. I think the nature and extent of the mining industry of the kingdom will be best realized by observations arranged under the following heads :—

- I. Quantity and value of the minerals raised.
- II. Mode and place of occurrence of the minerals.
- III. Number of persons employed in mining.
- IV. Progress of mining since 1876.

I. QUANTITY AND VALUE OF MINERALS RAISED.
GENERAL SUMMARY OF THE MINERAL PRODUCE OF THE UNITED
KINGDOM AND OF THE ISLE OF MAN.*

Description of Mineral.	1890.		1891.	
	Quantity.	Value at the Mines and Open works.	Quantity.	Value at the Mines and Openworks.
		£		£
Alum Clay (Bauxite) Tons „	11,527	5,763	10,763	3,228
Alum Shale . . „	6,420	802	5,474	684
Antimony Ore . . „	14	200	15 $\frac{1}{4}$	250
Arsenic . . . „	7,276	60,727	6,048	58,593
Arsenical Pyrites . „	5,114	4,414	5,095	4,370
Barytes . . . „	25,353	29,684	26,876	32,120
Bog Ore . . . „	14,512	7,256	16,075	8,037
Clays (except ordinary Clay) . . „	3,308,214	899,166	3,222,035	943,896
Coal . . . „	181,614,288	74,953,997	185,479,126	74,099,816
Cobalt and Nickel Ore . . . „	84	260	Nil.	—
Copper Ore . . „	12,136	27,801	8,836	20,214
Copper Precipitate „	345	4,670	322	4,355
Fluor Spar. . . „	268	392	141	187
Gold Ore . . . „	575	434	14,117	12,200
Gypsum . . . „	140,293	57,991	151,708	60,038
Iron Ore . . . „	13,780,767	3,926,445	12,777,689	3,355,860
Iron Pyrites . . „	16,018	7,666	15,463	8,002
Jet Lbs.	1,228	245	766	153
Lead Ore . . . Tons	45,651	406,164	43,859	356,783
Lignite . . . „	2,630	767	4,664	1,360
Manganese Ore . „	12,444	6,733	9,476	6,213
Ochre, Umber, &c. „	19,068	17,475	13,602	20,103
Oil Shale . . . „	2,212,250	608,369	2,361,119	707,177
Petroleum . . . „	35	52	100	150
Phosphate of Lime „	18,000	29,500	10,000	20,000
Salt „	2,146,849	1,100,014	2,043,571	976,824
Slates and Slabs . „	434,352	1,027,235	415,029	987,000
Stone, &c. . . „	—	8,708,691	—	8,693,743
Sulphate of Strontia „	10,276	5,138	8,061	4,030
Tin Ore. . . . „	14,911	782,492	14,488	735,240
Uranium Ore . . „	22	2,200	31	620
Wolfram . . . „	104	1,848	138	3,341
Zinc Ore . . . „	22,041	109,890	22,216	113,445
Total values ,	—	92,794,481	—	91,238,032

* Mineral Statistics of the United Kingdom of Great Britain and Ireland, with Isle of Man, for the year 1891. London, 1892. p. 5.

A brief glance at this table will show the overwhelming importance of coal mining. Only three items in the list for 1891 exceed one million pounds sterling in value, viz. : coal, iron ore and stone. Coal furnishes 81·2 per cent. of the total value of all the minerals raised, iron ore 3·6 per cent., and stone, etc., 9·5 per cent., leaving little more than 5 per cent. of the total for all the other minerals put together, viz. : the metallic minerals, such as the ores of copper, lead, tin, zinc, and the so-called non-metallic minerals, such as barytes, oil shale, salt and slate.

The table includes practically the whole of the minerals raised in the United Kingdom, whether obtained from underground workings, open quarries, or brine wells. Peat which is reckoned as a mineral in some countries is, however, omitted, and no credit is taken for the value of mineral waters other than brine. The value is reckoned "at the mine," and in the dressed or undressed state, according to the custom of the trade. Thus, the quantity and value of the ores of copper, lead, tin, and zinc are taken when they have been cleansed by washing or other processes, and so rendered fit for the smelter. The next table is designed to set forth the relative importance of each of the divisions of the kingdom as a mineral-producing country ; and it must be here remarked that, for the sake of agreeing with the official figures, the Isle of Man is included, though not, strictly speaking, forming part of the United Kingdom.

COUNTRY.	Total value of Mineral raised.	
	1890.	1891.
England	£ 66,621,842	£ 65,334,539
Wales	14,959,188	15,064,012
Scotland	10,705,780	10,356,054
Ireland	406,512	394,233
Isle of Man.	101,159	89,194
Total value	92,794,481	91,238,032

II. MODE AND PLACE OF OCCURRENCE OF THE MINERALS.

ALUM CLAY.—Alum Clay or bauxite occurs with beds of pisolitic iron ore between sheets of Tertiary basalt in County Antrim.

ALUM SHALE.—A little alum shale is being obtained in Yorkshire from a bed underlying a seam of coal.

ANTIMONY ORE.—Small quantities of antimony ore have been raised from veins in Scotland and North Cornwall.

ARSENIC.—The arsenic mentioned in the list is arsenious acid ; much of it is a by-product obtained in preparing the tin and copper ores of Cornwall and Devon for the market, and it might be considered by some as more properly belonging to the domain of the metallurgist than that of the miner. On the other hand, as it results from a process carried on at the mines, there are grounds for including it in the list.

ARSENICAL PYRITES.—The quantity of this mineral stated in the table is exclusive of pyrites used in making the arsenic mentioned above. It is likewise the produce of Cornwall and Devon.

BARYTES.—There are three principal barytes districts : Northumberland, Shropshire and Ireland. Northumberland supplies the valuable mineral witherite, the carbonate ; the produce of Shropshire and Ireland is mainly heavy-spar, the sulphate.

BOG IRON ORE.—The bog iron ore raised in Ireland is principally used for purifying gas.

CLAY.—Large quantities of clay are worked in various parts of the United Kingdom, and are obtained from strata belonging to very different geological periods. Fire-clay is largely mined in the Coal Measures, forming the under-clay of some of the seams. The two minerals are sometimes worked together ; in other cases the fire-clay is the sole object of mining, although overlain by a very thin seam of coal.

Among other clays may be mentioned the pottery clays of Lower Tertiary age, occurring in Devonshire and Dorsetshire ; the china clay of Cornwall and Devonshire is derived from granite decomposed *in situ*.

Bedfordshire and Surrey yield Fuller's earth, which there occurs

in the Lower Greensand. A like mineral is obtained in Somersetshire from beds of Jurassic age.

COAL.—The coal of the United Kingdom is mined in rocks belonging to the Carboniferous epoch, and mainly from the true Coal Measures. In the North of England, however, some of the coal seams are geologically older, as they occur in strata of the same age as the Carboniferous Limestone; and some of the coal in Scotland is of still earlier date, being found in the Calciferous Sandstone at the base of the Carboniferous rocks. The seams worked vary from 11 or 12 inches to 30 feet in thickness, but the “ten yard coal” of Staffordshire must be regarded as quite exceptional. The term “coal,” as used in the table, includes anthracite as well as bituminous and non-bituminous coal. Anthracite is found mainly in the western part of the South Wales coal-field, but the exact quantity produced cannot be stated, as it is not separated from other coals in the official statistics.

The three great coal counties are Durham, Glamorganshire, and Yorkshire; the first produces nearly 30 million tons annually, the two last more than 20 million tons each. The exports to foreign countries of coal, coke, and patent fuel in 1891, amounted to 31 million tons, whilst $8\frac{1}{2}$ million tons were supplied to steamers engaged in foreign trade.

COBALT AND NICKEL ORE.—The only mine recently worked for an ore of these metals in the British Isles is unfortunately closed at the present time. It afforded an instance of the occurrence of the mineral asbolane with red clay in irregular cavities in the Carboniferous Limestone.

COPPER ORE.—Copper mining is no longer an industry of much importance in Britain. Cornwall and Devonshire are the main sources of supply of the ore, and copper-precipitate is being obtained from cupreous water pumped up from one of the old mines on the celebrated Parys mountain in Anglesey.

FLINT.—Flint mining is more interesting from an antiquarian than from a commercial point of view. Old pits in the chalk in East Anglia furnished the men of Neolithic times with the material they needed for making axes, knives, and arrow-heads; and mining

still lingers in this district for the purpose of supplying gun-flints, "strike-a-lights," and ornamental stones for building purposes. More than four million gun-flints were made by the Brandon knappers for export in 1891.

FLUOR SPAR.—Derbyshire produces the variety of Fluor Spar known as "Blue John," used in making ornaments.

GOLD ORE.—Compared with the yield of the Colonies and many other countries, the amount of gold obtained in Britain is insignificant; but, nevertheless, mineral veins in North Wales have from time to time furnished considerable quantities of rich auriferous quartz.

GYP SUM.—Gypsum occurs in the counties of Cumberland, Nottingham, and Stafford, in rocks of Triassic age, whilst the seam mined in Sussex is considered to belong to the Purbeck Beds.

IRON ORE.—There are two great iron-producing districts—Cleveland or North Yorkshire, yielding over 5 million tons annually, and Cumberland and North Lancashire, with an output of nearly 2 million tons.

The Cleveland ore, an earthy carbonate, occurs in the form of bed about 10 feet thick in the Middle Lias; whilst the red hæmatite of the two other counties is found mainly in the form of huge irregular masses in the Carboniferous Limestone.

On an average the Cleveland ore contains about 30 per cent. metal, and the red hæmatite 50 to 60 per cent. The consequence is that though very much smaller in quantity, the output of Cumberland and Lancashire is worth considerably more than that of the Cleveland district. Open workings in Lincolnshire and Northamptonshire furnish no inconsiderable supply of a cheaply wrought stratified brown iron ore belonging to the Inferior Oolite.

IRON PYRITES.—Great Britain is dependent mainly upon Spain and Portugal for its supplies of sulphur-bearing minerals, and the quantities now raised at home are small. Nodules of more or less pure iron pyrites ("copperas lumps") are picked out at some coal mines, and the mineral is also worked on a small scale in Wales and Ireland.

JET.—Jet mining is not pursued as a regular occupation in

cliffs near Whitby, but the farmers of the district sometimes employ a few of their men in burrowing for the mineral during stormy weather when there is no suitable work for them out of doors.

LEAD ORE.—Lead ore comes from no less than seventeen counties and from the Isle of Man. Durham heads the list; but the most productive mine is Foxdale, in the Isle of Man, with a yearly output of 4,700 tons of dressed ore. The lead ore, which is almost entirely galena, occurs in veins in rocks of different ages, but especially in those of the Carboniferous epoch. Foxdale, however, is an instance of a highly productive lead vein in granite. Much of the galena contains enough silver to enhance its value.

LIGNITE.—The only lignite worked in the United Kingdom is a seam of Lower Tertiary age at Bovey Tracey in Devonshire.

MANGANESE.—Twenty years ago Devonshire possessed important manganese mines. Its production has now dwindled down almost to nothing, and nearly 95 per cent. of the British manganese ore comes from North Wales; it there occurs in the form of a bed of earthy carbonate, intercalated among the grits and conglomerates of the Cambrian Period. It is used in the manufacture of spiegeleisen and ferromanganese, and contains from 25 to 32 per cent. of metal. Some specimens of the ore will take a good polish, and can be used for ornamental purposes.

OCHRE AND UMBER.—Some of the ochre of Anglesey—the largest producer of this mineral—is obtained from a native earth dug up from shallow pits, and a considerable amount is deposited by the ferruginous water from the copper precipitation pits when exposed to the action of the atmosphere in shallow ponds.

OIL-SHALE.—The oil-shale industry of Scotland is of no small importance, and the quantity mined has increased very considerably during the last twenty years. The county of Linlithgow yields more than half of the total output; the mineral occurs here in seams in the Calciferous Sandstone at the base of the Carboniferous Rocks.

PETROLEUM.—Petroleum is mentioned simply to show that it is not absolutely wanting in Great Britain. The oil oozes out from a bed of sandstone which forms the roof of a coal seam in Derbyshire.

PHOSPHATE OF LIME.—Competition from other countries

possessing deposits which can be more cheaply worked, has greatly interfered with British phosphate industry. The mineral is obtained from beds in the Cretaceous rocks, viz: from the top of the Lower Greensand in Bedfordshire and the base of the Chalk Marl in Cambridgeshire. The phosphate beds of the Crag in Suffolk are no longer worked.

SALT.—Most of the salt is produced from brine especially in Cheshire, and also in Durham, Lancashire, Staffordshire, Worcestershire, and Yorkshire. Rock-salt is mined in Cheshire and in County Antrim, but the quantity so obtained is only one-ninth of the total output. In some cases the brine flows through pipes to the alkali works and converted directly into soda by the Solvay process.

SLATE.—North Wales furnishes nearly all the slate; speaking roughly, two-thirds of the Welsh slate are produced from open quarries and one-third from mines, that is to say true underground excavations.

STONE.—Stone forms an important item as regards value, and under this head are included, not only various kinds of stone used for building purposes, as well as for paving and road metal, but also all chalk, ordinary clay, gravel and sand. As no official returns of quantity are available, excepting in cases where the minerals are obtained from true *mines*, it is necessary to make an estimate of the value based upon the number of persons employed, as ascertained by the latest published census figures. It has been assumed that each man earns a certain average sum yearly, and that the value of the mineral produced bears some definite relation to these earnings.

SULPHATE OF STRONTIUM.—This mineral is dug from shallow pits in Gloucestershire and Somersetshire. It is found in the Red Marl, belonging to the Keuper Beds.

TIN.—Save a few tons coming from Devonshire, all the tin of Great Britain is of Cornish origin. The ore occurs in veins and stockworks, both in the granite and the overlying slate. No alluvial deposits are worked at the present day: the so-called “stream works” are merely dressing floors erected for treating the dirty water flowing away from some of the mines, which still carries enough tin ore in suspension to be worth working.

URANIUM ORE.—A mine has been worked lately in Cornwall solely for uranium minerals.

WOLFRAM.—Cornwall forms no exception to the rule that tin ore is frequently accompanied by wolfram ; but there is only one mine, East Pool, which produces any large quantity of the mineral.

ZINC ORE.—The Zinc ore is almost entirely blende, and is obtained from veins in the Palæozoic rocks in Cumberland, Wales, and the Isle of Man.

III.—NUMBER OF PERSONS EMPLOYED.

The total number of persons employed in and about all mines in the United Kingdom, together with the Isle of Man, and inclusive of those employed in private branch railways and tramways, and in washing and in coking coal in premises adjacent to or belonging to the mines, and exclusive of those engaged at open works and brine wells, amounted in 1891 to 707,411 ; of these 559,189 were employed below ground, and 148,222 above ground ; of these latter, 6,112 were females.

IV.—PROGRESS IN MINING SINCE 1876.

The progress accomplished in British Mining since the Centennial Exhibition of 1876 may be gauged by various standards, such as output, number of persons employed, technical improvements, safety and thrift.

Comparing 1891 with 1876, there is an increase of 51 million tons in the output of coal, and of more than 100,000 persons in the total number employed at mines. Among the advances, from a technical point of view, may be mentioned the use of electricity for various purposes, the introduction of more powerful and less dangerous explosives, better excavating machinery, more durable wire ropes, and safer mining lamps, to say nothing of improved and more economical methods of preparing the minerals for sale.

The gain in safety may be expressed exactly in figures. The death-rate from accidents among the persons employed above and below ground at mines was reduced from two per 1,000 annually

in the three years 1874–1876 to 1·71 per 1,000, in the three years 1888–1891, which is equivalent to a saving of 539 lives in the latter triennial period, or 179 per annum.

In spite of this diminution in the number of fatalities, there has been a growing disposition on the part of the miner to make provision for himself, in case he should be disabled, and for his wife and children if he should unfortunately lose his life through an accident. As lately as 1878 the total number of persons insured in the Miners' Permanent Relief Societies was less than 100,000; in 1890 it was 268,971, approaching one-half of the working population employed in and about mines.

On all sides, therefore, there has been progress; and whilst the mineral wealth of the country has been rapidly developed, a not unsuccessful warfare has been waged against the various sources of danger which beset the miner's calling.

METALLURGY.

BY W. ROBERTS-AUSTEN, C.B., F.R.S.,

Professor of Metallurgy, Royal College of Science, Chemist and Assayer of the Mint.

The metallurgical industries of the United Kingdom have made great and rapid progress in recent years. The export trade in metals has much increased, and the internal trade in them has shown an equal development. The metallurgical methods employed have undergone great change, and the rise and progress of the general trade of Great Britain is in no small measure due to the advances which these changes have effected.

The present metallurgical districts of the United Kingdom are practically coterminous with its coal-fields; while the sites of many long-forgotten iron furnace are still indicated by the "hammer ponds" of the "Wealds" of Surrey and Sussex, which were the chief smelting districts of England when charcoal was the fuel used. The smelting of ores of tin still holds its own in Cornwall; but with this exception

the metallurgical industry of the kingdom is chiefly confined to that portion of the country which lies north of a line drawn between the tidal waters of the Severn and the Thames.

In tracing the progress of British metallurgy it may be well to limit attention mainly to the period which has elapsed since the Centennial Exhibition, held at Philadelphia in 1876. Naturally the iron and steel industry is of the first importance. At that time, the era of mechanical puddling, either by the aid of moving furnaces, or by specially arranged mechanical tools, was at its height. The various devices proposed by Menelaus, and later by others, among whom the names of Danks, Crampton, and Schneider may be mentioned, have tended to disappear; and puddling, where it is retained, has reverted to its simpler form, although in many cases gas-firing has replaced the direct combustion of solid fuel. In this connection it may be pointed out that increased attention has during the last few years been given to the direct reduction of iron from its ores by the Husgafvel and other allied processes, resembling those devised by Chenot and by Blair.

With the decadence of the puddling process, the use of cold blast in the blast-furnace has gradually diminished, until now it occupies but a very minor place. The general use of closed-top furnaces has been followed by that of a condenser plant for the collection of the ammonia from the waste gases of the furnace, just as the more modern coke ovens are now so often arranged for the collection of the tar and ammonia resulting from the dry distillation of the coal. Blast at much greater pressure than was formerly employed, and raised to a high temperature in the fire-brick stoves, which now replace the older forms of pipe stoves, has changed the character and the composition of the pig-iron produced, partly causing and being in part the result of changes in the subsequent treatment of the pig-iron. The blast furnace itself has not escaped modification. The suggested use of carbon bricks for lining the crucible portion of the furnace, and the greatly increased development of water cooling arrangements, mark important steps of progress in blast furnace practice. On the pig-bed, too, the use of powerful mechanical pig-breakers affords promise of a very considerable saving in arduous manual labour.

The rise and progress of the Bessemer and open-hearth processes are matters of common knowledge, though but little thought is given to the immense changes which these processes have brought about, both in the world's trade and in its industries generally. At the time of the Philadelphia Exhibition, Great Britain had given the world cheap steel; but confidence in the material was slowly gained, as the result of elaborate researches, which showed what was the most suitable thermal and mechanical treatment for the metal. The impossibility of eliminating phosphorus when acid furnace-linings were employed led to the use of basic-lined furnaces, which, in the hands of Thomas and Gilchrist, enabled the desired result to be attained. The difficulty which still remained in effecting the elimination of sulphur has also, to a great extent, been overcome both by Massenez and by Saniter. The desirability of "recarburising" the ingot metal without the simultaneous addition of other elements has led to the partial introduction of the Darby process, in which the molten metal to be recarburised is brought into direct contact with coke or anthracite. In the rolling-mill the use of the soaking-pit, either in its simplest form or when connected with some local source of heat, has become common. In the period under review, there has been a revival of the older types of the Bessemer converter in somewhat modified forms—the Clapp-Griffith process being a case in point. The use of very small converters in certain works has also been advocated, and the Robert process may be mentioned in this connection. A mixed Bessemer and open-hearth process has also been employed, and the charging of molten metal direct from the blast-furnaces into the open hearth has been the subject of much discussion. The open-hearth furnaces have tended to increase greatly in size, and the shape of the furnace has recently undergone considerable alteration, certain works having adopted the U-shaped form proposed by Siemens.

Alloying iron with other elements has been the subject of much attention. The action of silicon and other elements in changing the mode of existence of carbon in pig-iron has assumed importance in the foundry; and in steel-works nickel now plays an important part the mode of its action being still a subject of discussion. Chromium,

tungsten, and copper have all been employed, with more or less advantage, as additions to ordinary steel; while manganese, in Hadfield's "manganese steel," has been shown to produce alloys with iron which possess remarkable mechanical and electrical properties. Greatly increased attention has been directed to the theory of hardening steel, and to the changes which the various elements in steel undergo when subjected to this treatment. The accurate measurement of high temperatures has not only become possible, but is being actually introduced in the larger blast-furnace plants, and the use of thermo-junctions for this purpose seems likely to become of great industrial importance.

In the case of copper the smelting methods in use at Swansea, the chief centre of the copper industry of the United Kingdom, have undergone considerable modification in recent years, mainly because the importation of copper in the form of ore has to a great extent been replaced by copper regulus, which is frequently highly argentiferous. The alterations introduced consist in a diminution of the number of fusions and "calcinations," combined with a mixed cupola-reverberatory treatment. The cupolas have, in many instances, external "wells" in which the regulus and slag resulting from the fusion of the charge are able to separate completely from each other before the regulus is finally tapped. In another modification of the ordinary Welsh process, rapidity of out-turn has been secured by a method in which low grade regulus is concentrated by fusion with a portion of the same regulus which had been previously roasted or "calcined." The slags produced in this method are added to the cupola charge.

The collection of the silver contained in the regulus has, in recent years, been effected mainly by electrolytic methods, though the ordinary Augustin and Ziervogel methods are still in use in South Wales. In the electrolytic process either the whole of the coarse copper is refined direct, or else auriferous and argentiferous "bottoms" are produced which are subsequently refined electrolytically. Another process in use for the treatment of these bottoms consists in dissolving them in sulphuric acid by the aid of steam, for the manufacture of copper sulphate, the gold and silver remaining

undissolved in the resulting mud as in the electrolytic process. At another works, the bottoms are hollow-granulated, roasted to oxide, and then treated by a mixed Ziervogel-Augustin process, the auriferous residues remaining after leaching being returned over and over again to the copper smelting furnaces until they are sufficiently rich in gold to pay for the extraction of that metal.

In reference to the wet process for the treatment of copper ores, it is only within the period under review that the ordinary wet chloride process, combined with the Claudet method of desilverisation, has assumed the important position that it still occupies. The process itself and its applications are too well known to need further reference; but a satisfactory modification of this method, admitting of the collection of more gold than is now extracted from the roasted pyrites residues, is still wanting.

The quantity of sulphate of copper now made is about 25,000 tons yearly, and in its production many thousand ounces of gold and silver are recovered.

The electrolytic processes referred to above have scarcely made the progress which was at one time anticipated, but after a period of temporary suspension they appear to be again coming into more general use. The total weekly output of electro-copper in Great Britain probably exceeds 300 tons. Nor has the use of the Bessemer process, as applied to the treatment of copper regulus, progressed in the United Kingdom. Great difficulty was experienced in preventing the rapid slagging away of the converter lining, the low temperature of the latter stages of the process preventing the use of suitable additions to protect the lining from the corrosive action of the highly ferruginous slag. In other countries, where a cheaper and sufficiently fire-resisting material is readily available, the process has proved to be successful, but the conditions most favourable to its use do not obtain in the metallurgical district of South Wales.

In lead smelting the reverberatory methods have in many cases been replaced by cupola smelting, especially when mixed ores of lead, copper, and silver have to be treated. Some of the ingenious mechanical contrivances which are widely used in the United States have been introduced. The plumbiferous regulus, however, result-

ing from the cupola treatment is usually finally treated in a reverberatory. The cupolas in use in this country are mainly round ones, resembling the Pilz furnaces of the Freiberg district rather than rectangular ones of the Raschette type. Of the two main types of reverberatory treatment, neither the Flintshire nor the Flowing Furnace methods are often adopted in their simplest forms, endless though slight modifications having been introduced at the different works. The main alterations in the smelting of lead ores relate to the desilverisation of the reduced lead. Where it is a question of producing a definite quality, which is specially adapted for certain purposes, such, for instance, as the manufacture of lead white, the older crystallisation process of Pattinson still holds its own—an interesting application of the crystals of lead obtained in this process consisting in their conversion into slabs for use in secondary batteries. As a general rule, however, the Pattinson process has been replaced either by the Parkes zinc method, or by a mixed Pattinson-Parkes treatment, the ordinary Pattinson process being too laborious and much too slow. The works using the Parkes process vary greatly in their treatment of the enriched zinc skimmings. Several methods of distillation are in use, and sometimes no effort at all is made to save the zinc; in one such method the liquated zinc-silver-lead alloy being simply fused with litharge, the resulting lead being subsequently cupelled. Then, again, the methods of dezincifying the hard lead remaining after desilverisation are somewhat varied, a simple softening in a reverberatory furnace being adopted in one instance, while in another the lead may be heated to redness in a Pattinson pot and then subjected to the action of superheated steam. In the case of lead as well as of other metals, the use of the Bessemer process has been suggested, both in the treatment of galena for lead and in the subsequent oxidation of the lead for the separation of the silver it contains; but no such plant is in use in Great Britain.

In the metallurgy of zinc the Silesian retort has been largely replaced by the smaller Belgian one, but the actual distillation process has undergone little change. Direct firing has been very largely replaced by gas firing, and the tendency now appears to abandon the more complicated forms of brick-filled

regenerator chambers in favour of simpler forms of heat-storing chambers or channels, the common form of regenerator becoming too rapidly choked by the escaping zinc fumes. The forms of kilns and reverberatory furnaces in use for the calcination or roasting of the zinc ores need no comment. At some works a complicated washing plant, consisting mainly of jigs and tables, is in use for the concentration of the residues remaining in the zinc retorts.

The metallurgy of tin remains almost unchanged. The reduction of the metal is almost solely effected in reverberatory furnaces. Some difficulties, however, still remain to be overcome, mainly in connection with the slag formed during the process. This contains a considerable percentage of tin, which is not now recovered. Efforts have been made to avoid the loss of the metal in this way by the use of neutral furnace-linings, and in various other ways.

Of what used to be the rarer metals, aluminium is the one which has received of late the most attention. There is a tendency to abandon the processes for its manufacture which demand the use of metallic sodium, and to favour those which involve the electrolysis of fused baths of aluminium compounds, or, as in Cowles' process, the direct reduction of alumina by carbon, aided by a strong electric current. Castner's process, which, at the time of its introduction, greatly diminished the cost of production of aluminium, is now mainly employed for the manufacture of sodium alone. The use of copper and of other elements, such as titanium, as additions to aluminium for the purpose of hardening the metal and of increasing its tensile strength, has received attention and met with some success.

Nickel, too, is another metal which has assumed much importance of recent years. Its metallurgy proper as carried on in the United Kingdom has undergone but little change, except that the use of magnesium and similar deoxidising materials has enabled the metal to be produced in a readily malleable form. Great interest has been aroused by Mond's discovery that carbonic oxide forms a volatile compound both with nickel and with iron, and hope is held of a successful application of this discovery at the works which are now being erected at Birmingham for the reduction of nickel from

its ores by this method. Its application in connection with the metallurgy of iron has given to nickel an importance which it did not previously possess.

Antimony is another metal whose metallurgy is marked by little signs of change. Antimony ores being frequently auriferous, an almost endless number of methods have been proposed for the purpose of collecting the gold from them. They are very varied in character, and include, amongst others, the collection of gold in "bottoms," by liquation, Pattinsonising, sublimation and electrolysis; but success has been but partial. In the collection of gold contained in auriferous pyrites, a noticeable improvement of great industrial importance lies in the use which has been made in South Africa and elsewhere of the solvent action of a weak solution of potassium cyanide, a process which has enabled much poorer material to be treated than was previously possible.

Of the rarer metals little need be said. Their application is restricted, and the metallurgical processes connected with their reduction are more or less of a purely chemical nature. In the case of the platinum industry, however, there has been an extraordinary development, due mainly to the skill and enterprise of successive members of the firm of Johnson, Matthey and Co., who in later years have based their operations on the results of the investigations of Deville and Debray. Some indication of the value of the material dealt with may be gathered from the statement that two and a half hundred-weight of platinum may easily be melted in a single charge, and that the firm in one operation extracted a mass of palladium valued at £30,000 from gold platinum ore actually worth more than a million sterling. The various alloys, again, require but little reference. Science has been enriched by the production of several new alloys of interest, and in one instance, at least, of a beautiful colour, while other alloys have actually come into industrial use.

There can be no question that the spread of technical instruction in metallurgy has led to the possession by managers of works of a greater knowledge of the chemical reactions which are taking place in the

furnaces under their charge ; and it is to be hoped that the time is not far distant when even the work-people will have an intelligent knowledge, not only of the operations they conduct, but also of the physical and chemical phenomena on which the success of their labours depends.

The most striking feature in the whole range of metallurgy is probably presented by the growing attention which is being devoted to the study of the properties of metals and alloys as influenced by thermal or mechanical treatment, and by the presence of even "traces" of foreign matter. The wide adoption of the so-called silicon and phosphor bronze, and of varieties of steel with small quantities of added elements, are cases in point. The pyrometer and the Wheatstone bridge are becoming as useful adjuncts to the works laboratory as the chemical balance. The increased use of physical methods in connection with metallurgy is truly remarkable, as is the evidence that in this country the traditional love for the study of metals is reviving, with the recognition of the fact that the empire over matter may as certainly be gained in the field of metallurgy as in any other.

DEPARTMENT E.

MINES, MINING, AND METALLURGY.

Unless otherwise stated, the Exhibits in this Department are in the Mines and Mining Building.

103 Collection of Economic Minerals.

(Formed by Mr. Bennett H. Brough.)

I. ALUM :—

1. Alumstone, presented by Messrs. J. H. Cookson & Son.
2. Alum shale, from Park Hill Colliery, Wakefield.
3. Alum clay (or bauxite), from Correen Mine, Broughshane, County Antrim.

II. ANTIMONY ORE :—

1. Antimony ore, from Dumfriesshire, Scotland.

III. ARSENICAL PYRITES :—

1. Mispickel with tin ore, New Cook's Kitchen Mine, Cornwall.
2. Arsenical pyrites, Levant Mine, Cornwall.
3. Arsenical pyrites, Devon Great Consols Mine, Tavistock.

IV. BARYTES :—

1. Crude barytes, Wotherton Mine, Shropshire.
2. Ground barytes, Wotherton Mine, Shropshire.
3. Barytes, white, Snailbeach Mine, Shropshire.
4. Barytes, black, Snailbeach Mine, Shropshire.
5. Barytes, Mawston Mine, Derbyshire.
6. Barytes, Dronmore Mine, Bantry, Ireland. From Mr. A. Forster.
7. Barytes, 99 per cent. of sulphate, Glendale Mine, Co. Leitrim, Ireland.
8. Barytes, 98 per cent. of sulphate, Glendale Mine, Co. Leitrim, Ireland.
9. Barytes, manufactured state, Glendale Mine, Co. Leitrim, Ireland. From Mr. G. L. Tottenham.
10. Barytes, from the mines of the Devonshire Baryta Chemical Co., Bridford, Devonshire.
11. Witherite, a mineral worth about \$20 per ton, from the Snailbeach Mine, Shropshire.
12. Witherite, from the Old Gang Lead Mine, Swaledale.

V. CLAYS :—

1. Blue-ball clay, from Messrs. Pike Brothers' mines at Wareham, Dorsetshire, used for the manufacture of fine white earthenware. It is interesting to note that written records show that this clay was used by Josiah Wedgwood in 1791.

2. Series of specimens of clay from the North Devon Clay Co. of Torrington, Devon, with a photograph showing the open workings. The clay is cut by one man in a straight line, and then is cut across by a second; a third undercuts with an adze, clearing out the clay in 8-inch cubes. The specimens exhibited include potters' blue-ball clay, ivory clay, stoneware clay, best tobacco pipe clay, and household clay.

3. Fire clay, from the Rough Lee Colliery, belonging to the North Beechburn Coal Co. This colliery is in the centre of the great Durham coking coal district. The clay is extensively used for making fire-bricks and sanitary pipes. It is met with at the base of the Busty Bank seam, the lowest in Durham, except one.

4. Specimens of nine varieties of clay raised by the Devon and Courtenay Clay Co., Newton Abbot, Devonshire, with a section of the beds worked.

5. Stourbridge fire clay.

6. Fire clay from the Albion Clay Company, Limited (Woodville district of the Leicestershire coalfield).

See also Fuller's earth. (Section XI.)

VI. COAL :—

1. Coal from the 10-yard coal seam and ironstone, South Staffordshire, from Mr. H. W. Hughes. The specimens exhibited are as follows, the rocks being arranged in the order in which they occur in the strata :—

a. Brooch Bends ironstone.

b. Brooch coal.

c. Benches coal, the lowest layer of the Ten-yard coal.

d. Top slipper coal, the top layer of the Ten-yard coal.

e. Stourbridge fire clay.

f. Heathen coal.

g. Gubbin ironstone.

h. White ironstone.

i. Fireclay balls, ironstone.

k. Silurian limestone.

2. Coal from Yorkley, in the Forest of Dean. Three-foot house coal from the Dan's Drift Colliery.

3. Coal from the Trenchard seam of steam or gas coal, the

deepest in the Forest of Dean, at the Bream Grove Colliery. The seam is 4 feet 6 inches thick and has a good rock roof.

4. Coal from Messrs. J. & J. Charlesworth's Robin Hood Colliery, Wakefield.

5. Coal from Messrs. Terry, Greaves & Co.'s Old Roundwood Colliery, Wakefield.

6. Coal from Messrs. J. & J. W. Woodhead's Manor Colliery.

7. Anthracite. Big Vein coal, containing carbon 92·27 per cent., hydrogen 3·58, oxygen and nitrogen 1·8, sulphur 0·68, and ash 1·67, from Gwaun Cae Gurwen Colliery, Swansea, South Wales.

8. Anthracite. Peacock Vein coal, containing carbon 91 per cent., hydrogen 3·07, oxygen and nitrogen 2·95, sulphur 0·72 and ash 2·26, from Gwaun Cae Gurwen Colliery, Swansea, South Wales.

9. Coal from collieries in the North of England, selected by Professor J. H. Merivale. All the specimens are from the Low Main seam, the most valuable one in the district.

10. Cannel coal from Flintshire.

11. Coal from the United National Collieries, Cardiff.

VII. COBALT :—

1. Cobalt ore, crude. Foel Hiraddug Mine, North Wales.

2. Asbolane, from Foel Hiraddug, North Wales.

VIII. COPPER ORE :—

1. Copper pyrites, Coniston Mining Syndicate, Limited, Coniston, Lancashire.

2. Yellow copper ore, Wheal Uny, Cornwall.

3. Yellow copper ore, New Cook's Kitchen Mine, Cornwall.

4. Copper ore and zinc blende, New Cook's Kitchen Mine, Cornwall.

5. Copper ore, Mona and Parys Mines, Anglesea, North Wales.

6. Copper ore, Devon Great Consols Mine, Tavistock.

7. Copper ore, Laxey Mine, Isle of Man.

8. Copper ore, East Pool Mine, Cornwall.

9. Copper precipitate, Mona and Parys Mines.

IX. FLINT :—

1. Specimens to illustrate the mining and manufacture of flints at Brandon, Suffolk, from Mr. R. J. Snare. The mining of these has been carried on ever since Neolithic times. The methods of

excavating and of manufacture are described by Mr. S. B. J. Skertchly, in a memoir published by the Geological Survey of Great Britain in 1879. The collection includes :—

- a, b.* Specimens to illustrate process of knapping.
- c.* Square house flint.
- d.* Circular house flint.
- e.* Musket flints.
- f.* Carbine flints.
- g.* Horse pistol flints.
- h.* Pocket pistol flints.
- i.* Double-barrelled rifle flints.
- k.* Single-barrelled rifle flints.
- l.* Tinder box flints.
- m.* Arrow heads.
- n.* Spear heads.
- 2. Flint implements, presented by Mrs. W. Weller Poley.
 - a.* Palæolithic flint implement from Santon Downham, near Brandon.
 - b.* Leaf-shaped arrow-head from Brandon.
 - c.* Barbed arrow-head from Brandon.

X. FLUOR SPAR :—

- 1. Fluor spar ("Blue John"), Weardale, Durham.
- 2. Fluor Spar, New Cook's Kitchen Mine, Cornwall.

XI. FULLER'S EARTH :—

- 1. Fuller's earth from Mr. H. N. Garrett, Midford, near Bath.
 - a.* Drab lump, dried.
 - b.* Blue lump, dried.
 - c.* Refined lump, from which 30 per cent. of dross has been extracted.
 - d.* Refined lump, from which 30 per cent. of dross, sand, and grit has been extracted.
 - e.* Powdered earth, for druggists' use.
 - f, g.* Powdered earth for oil refining.
 - h.* Refined earth, before being dried.
 - i.* Fossils found in the Fuller's earth.

XII. GOLD ORE :—

- 1. Auriferous quartz, from the Morgan Gold Mine, North Wales. A series of 24 specimens illustrative of the lodes and enclosing rocks of the auriferous district.

XIII. GYPSUM :—

1. Gypsum from the works of the Sub-Wealden Boring Company, Sussex.
2. Gypsum from the Vale of Belvoir and Newark Plaster Company.

XIV. IRON ORE :—

1. Red hæmatite from the Gillfoot Park Mining Co., Egremont.
2. Iron ores from the Midland Company's mines at Frodingham, Lincolnshire.
3. Red hæmatite, very free from phosphorus and sulphur, from the Park Iron Mines, North Lancashire.
4. Red hæmatite from the mines of the Hodbarrow Mining Co., Millom, Cumberland.
 - a. Kidney variety.
 - b. Laminated variety.
 - c. Amorphous variety.
5. Ironstone (Cleveland) from the Eston Mines, the property of Messrs. Bolckow, Vaughan & Co., Limited. The seam at this point is 14 feet in thickness, and yields 33 per cent. of iron. It is of Middle Liassic age.
6. Iron ore from the Regil Mining Co., Winford, near Bristol.
7. Iron ore from open works, Northamptonshire.
8. Iron ore from the Antrim Iron Ore Company.

XV. IRON PYRITES :—

1. Iron pyrites, Cae Coch Mine, North Wales.
2. Iron pyrites, Cronebane and Tigroney Mines, Ovoca, Co. Wicklow, Ireland.
 - a. Non-cupreous ore, with 38 per cent. of sulphur.
 - b. Cupreous ore, with 40 per cent. of sulphur and 3 per cent. of copper.

XVI. JET :—

1. Jet from Whitby, Yorkshire. It is found in what is locally known as the Jet Shale, overlying the Cleveland main band of ironstone.

XVII. LEAD ORE :—

1. Galena from the Snailbeach Mine, Minsterley, Shropshire.
2. Galena from Mr. W. Bowman's Mawston Mine, Derbyshire.
3. Galena from the Milwr Mining Co.'s Mines, Holywell, Flintshire.
 - a. Ore from the South String.
 - b. Ore as sold, containing $82\frac{1}{4}$ per cent. of lead and 6 ozs. 13 dwt. of silver per ton.
4. Galena from the Coniston Mining Syndicate, Limited, Lancashire.
5. Galena from the Rushen Mine, Isle of Man.
 - a. Rich specimen of galena.
 - b. Galena crystals on quartz.
 - c. Galena, zinc blende and quartz.
 - d. Galena partly converted into lead carbonate.
6. Galena, with 18 ozs. of silver per ton, from East Darren mine, Cardiganshire.
7. Galena from the Old Gang lead mines, Swaledale.
8. A series of specimens of lead ore from the Halkyn Mine, North Wales.
9. Lead ore from the North Wales Leadworks, Limited.
10. Galena from Unity Wood Mine, Cornwall.
11. Specimens of lead ore, Great Laxey Mine, Isle of Man.
12. Galena from Minera Mine, Wrexham, North Wales.
13. Galena from Foxdale Mine, Isle of Man.
14. Galena from the Van Mine, Llanidloes, North Wales.
15. Galena from the Rushen Mine, Isle of Man.

XVIII. LIGNITE :—

1. Lignite from Bovey Tracey, Devonshire.

XIX. MAGANESE ORE :—

1. Manganese ore from Mr. J. Roberts, Benallt Mine, Rhiw, North Wales.
2. Manganese ore from Mr. E. Pritchard, Llyndywarchen Mine, near Harlech, North Wales. The ore is obtained from a bed in the Cambrian rocks, and the specimens show the formation of the black hydrous oxides from the earthy carbonate along planes of bedding and joints.
3. Manganese ore, with 30 per cent. of manganese, from Craig Uchaf Mine, Llanbedr, Merionethshire, North Wales.

4. Manganese ore, from Mr. H. J. Wright, Dyffryn Mining Co., Merionethshire, North Wales.

5. Manganese ore, from Moelfre Mine, near Barmouth, North Wales. Cut and polished. Presented by Prof. C. Le Neve Foster.

XX. OCHRE :—

1. Ochre from the Cronebane and Tigroney Mines, Ovoca, co. Wicklow, Ireland.

a. Crude yellow ochre.

b. Pond ochre.

2. Ochre from Mona and Parys Mines, Anglesea, North Wales.

a. Native ochre.

b. Manufactured ochre.

3. Ochre. Red and yellow oxides from the Regil Mining Co. Winford, near Bristol.

a. Oxide of iron.

b. Yellow ochre.

c. Manufactured red oxide.

d. Manufactured yellow ochre.

XXI. OIL SHALE :—

1. Oil Shale from the Broxburn Oil Co., Broxburn, Scotland.

a. Specimens from the Broxburn seam.

b. Specimens from the Drumshoreland seam.

XXII. PETROLEUM :—

1. Petroleum from Southgate Colliery, Derbyshire.

XXIII. PHOSPHATES :—

1. Coprolites from Cambridgeshire, with 58 to 60 per cent. of phosphate of lime.

2. Coprolites from Bedfordshire, with 50 to 55 per cent. of phosphate of lime.

3. Coprolites from Norfolk, with 45 to 50 per cent. of phosphate of lime. These specimens (1-3) have been presented by Mr. W. Colchester.

4. Coprolites from the Suffolk Crag formation. A collection of fifty characteristic fossils associated with the coprolite beds. Collected and presented by Dr. J. E. Taylor, Curator of the Ipswich Museum, and by Mr. E. Packard.

XXIV. SALT :—

1. Rock salt from the mines of the Salt Union, Limited, Winsford, Cheshire.
2. Salt from brine, United Alkali Company, Limited, Hebburn-on-Tyne.

XXV. SLATE :—

1. Specimens of split slate blocks, the finest of the kind yet obtained, from the Oakeley Slate Quarries Co., Limited, Blaenau Festiniog, North Wales.
2. Slate blocks, from Mr. C. Warren Roberts, Llechwedd Quarry, Blaenau Festiniog, showing the planes of stratification, cleavage, the lateral rending or rifting, termed "pillaring," and the natural joints at either end. There is a difference of 13° between the angle of stratification and that of the cleavage.

XXVI. STONE :—

1. Stone from Mr. J. J. Hulbert's Blue Stone Quarries, near Wakefield.
2. Silurian limestone from South Staffordshire.
3. Stone from the Bath Stone Firms, Limited, Bath.

XXVII. STRONTIUM :—

1. Strontium sulphate from the estate of the Rev. W. C. Randolph, Yate, Gloucestershire. Presented by Mr. T. Smith.
2. Celestine, from the Regil Mining Company, Winford, near Bristol.

XXVIII. TIN ORE :—

1. Four characteristic specimens of Cornish "elvans."
2. Tinstone from the Flat Lode, Wheal Uny.
3. Gossan, Silver Lode, North Dolcoath, Cornwall.
4. Tinstone associated with yellow copper ore and arsenical pyrites, Levant Mine, Cornwall.
5. Tinstone, Carn Brea Mine.
6. Tinstone, Dolcoath Mine.
7. Red "capel," Dolcoath Mine.
8. "Cab," Dolcoath Mine.
9. Rich tinstone, Cook's Kitchen Mine.
10. Tinstone, broken at bottom of engine shaft, 418 fathoms below adit, Cook's Kitchen Mine.
11. Quartz and iron carbonate, Cook's Kitchen Mine.

12. Granite, Cook's Kitchen Mine.
13. Green "capel," Cook's Kitchen Mine.
14. Lithomarge, Cook's Kitchen Mine.
15. Stannite, wolfram, and yellow copper ore, East Pool Mine.
16. Fluor spar, New Cook's Kitchen Mine.
17. Quartz, New Cook's Kitchen Mine.
18. Mispickel with tin ore, New Cook's Kitchen Mine.
19. Copper ore and zinc blende, New Cook's Kitchen Mine.
20. Carbonate of iron, Tincroft Mine.
21. Wood tin, Wheal Kitty.
22. Tinstone, Tregurtha Mine. The Cornish specimens, 1 to 22, were collected by Mr. W. Thomas, Secretary of the Mining Institute of Cornwall.
23. A series of specimens illustrating the occurrence of tin ore at South Condurrow Mine, Cornwall, from Mr. W. Rich.
24. Tin ores from East Pool Mine, Cornwall.
25. Tin ore, Wheal Dorothy, Cornwall.
26. Tin ore from Highburrow and Teague's lodes, Carn Brea Mines.

XXIX. URANIUM ORE :—

1. Uranium ore from the Uranium Mine, Grampound Road, Cornwall. Presented by Mr. B. Kitto.
2. Pitchblende from the Uranium Mine, from Mr. B. Kitto.
3. Pitchblende and uranite from the Uranium Mine, from Mr. W. Thomas.

XXX. WOLFRAM :—

1. Wolfram, with stannite and yellow copper ore, East Pool Mine, Cornwall, from Mr. C. F. Bishop and Mr. W. Thomas.

XXXI. ZINC ORE :—

1. Blende from Mr. W. Bowman's Mawston Mine, Derbyshire.
2. Blende from Trecastell Mine, Conway, North Wales.
3. Blende from the mines of the Milwr Mining Co., Limited, near Holywell, Flintshire, North Wales.
 - a. Blende from Old Milwr shaft.
 - b. Ore as sold, containing 61·88 per cent. of zinc, and 6 ozs. of silver per ton.
4. Blende from the Halkyn Mines, North Wales.
5. Calamine and fluor spar from the Halkyn Mines.
6. Blende from New Minera Mine, Wrexham, North Wales.
7. Blende from Talacre Mines, Holywell, North Wales.

8. Specimen of brecciated lode, zinc blende acting as cementing material, Talacre Mine, North Wales.

9. Blende, containing 52·5 per cent. of zinc, mixed with a little galena, from Moelwyn, near Festiniog, North Wales. Presented by Mr. E. Pritchard.

10. “Bluestone” from the Mona and Parys Mines, Anglesea, North Wales.

11. Blende from the mines of the Great Laxey Mining Co., Limited, Isle of Man.

12. Blende from Minera Mine, Wrexham, North Wales.

13. Blende from the Van Mine, Llanidloes, North Wales.

104 Collection of Economic Metallurgy.

(Formed by Dr. J. E. Ball.)

The samples of metallurgical products comprise a fairly representative collection of specimens illustrating the metallurgy of lead, copper, nickel, tin, and crucible steel as practised in the United Kingdom, together with various alloys, and especially of alloys of iron.

Samples illustrating the metallurgy of lead have been presented by Walkers, Parker & Co., of Bagillt, and the North Wales Lead Company, of Holywell. They illustrate the smelting of lead ores both by the reverberatory and blast furnace methods. Both the Parkes and the Pattinson processes of desilverisation are shown, and the further treatment of the desilverised lead is also illustrated. A series of thirty-five samples is devoted to the manufacture of shot, and the other applications of lead, in the form of pipes, sheet, white lead, &c., are shown by the aid of numerous specimens.

The processes of copper-smelting practised in the South Wales smelting districts are illustrated by specimens from the works of the Rio Tinto Company, and the Cape Copper Company, Britonferry, and the Landore Copper Company, Glamorganshire. The United Alkali Company, of Liverpool, shows other specimens descriptive of the further treatment of the burnt cupreous pyrites as practised in Lancashire, and which forms the source of a very large proportion of the silver resulting from the treatment of all the ores smelted in the United Kingdom.

These samples relate to the reverberatory and the mixed cupola-reverberatory methods for the treatment of copper ores, as well as to the treatment of such ores by wet methods.

The metallurgy of nickel is shown by a collection of specimens presented by Messrs. Henry Wiggin & Co., of Birmingham, and that of tin by samples from the works of the Redruth Tin Smelting Company, Cornwall. A series of brasses illustrating the varieties of this alloy used in the

Birmingham trade has been prepared by Ralph Heaton, Esq., of the Mint, Birmingham; and the Sheffield trade in crucible steel is shown by a collection presented by Messrs. Seebohm and Dieckstahl, of Sheffield, which shows the fractures of the various grades of steel made.

It has not been considered desirable to illustrate in this collection the ordinary processes for the manufacture of pig iron, iron, or steel, but attention has been mainly devoted to the collection of samples of the alloys of iron with other metals and with non-metallic elements, which have now become of such vast importance. Of such alloys the Darwen and Mostyn Iron Company, Darwen, has presented a considerable number, the specimens being rendered of great interest by being accompanied by complete analyses. They include samples of the various alloys of iron with manganese, silicon, and chromium, together with the slags produced in the manufacture of these alloys. Other similar specimens are shown by the Pyle and Blaina Works, of Blaina, Monmouthshire, the Cowles Syndicate Co., Milton, and Messrs. Commans & Co., of London.

Messrs. Billington and Newton, of Longport, Staffordshire, exhibit specimens of phosphor bronze and of similar alloys; whilst the Hadfield's Steel Foundry Company, of Sheffield, shows numerous samples of manganese steel, both as castings and in other forms, and some etched sections of steel rails are shown by Mr. C. P. Sandberg, of London.

GROUP XLIII.

MINERAL COMBUSTIBLES—COAL, COKE, PETROLEUM, NATURAL GAS, &c.

105 Cory Brothers & Co., Limited, Cardiff, South Wales; and
3 Fenchurch Avenue, London, E.C.

“Cory's Merthyr” smokeless steam coal; “Penrikyber Navigation” smokeless steam coal.

106 Crown Preserved Coal Co., Limited (The), Cardiff.

Patent fuel in blocks, “crown” brand.

107 North's Navigation Collieries (1889), Limited, Bute Docks, Cardiff.

Steam coal, coke; manufactured iron.

108 Turner, William & John, Wigan Junction Colliery, Wigan, Lancashire.

Specimens of cannel, and cannel nuts.

Low Moor Company, Limited. See GROUP XLIX.

GROUP XLIV.

BUILDING STONES, MARBLES, ORNAMENTAL STONES, AND QUARRY PRODUCTS.

- 109 Dean, John, *Central Buildings, Liverpool.* [See Advt.
Slate slab (plain and enamelled).
- 110 Farmer & Brindley, 63 *Westminster Road, London, S.E.*
Imperial Egyptian porphyry from ancient quarries, worked by
firm as the concessionaries.
- 111 Flynn & Co., Thomas M. H., *Bessbrook Granite Works, Bess-
brook, Ireland.*
Granite for building work, polished columns, polished thin slabs
for dados, halls, staircases, panels; granite monuments and borders,
Irish crosses; granite rollers and tables for grinding cocoas, paints;
paving setts and curbing; granite concrete paving blocks.

GROUP XLV.

GRINDING, ABRADING, AND POLISHING SUBSTANCES.

- 112 Beckmann & Co., 4, *Finsbury Street, London, E.C.*
Naxos emery wheels, emery slabs, emery gouges, emery files and
hones used by engineers' tool manufacturers, surgical and mathe-
matical instrument makers, and kindred trades, for grinding and
polishing all kinds of metals, glass, wood; specially adapted and
manufactured emery whetstones, emery reaping-files for agricultural
tools and implements, and emery knife-sharpeners for domestic
use.

Davies & Sneade. See GROUP LXXIX.

Flynn & Co., Thomas M. H. See GROUP XLIV.

Nixey, W. G. See GROUP XLVI.

GROUP XLVI.

GRAPHITE AND ITS PRODUCTS; CLAYS AND OTHER FICTILE MATERIALS
AND THEIR DIRECT PRODUCTS; ASBESTOS, &C.

- 113 Albion Clay Co., Limited, *Albion Works, Woodville, Burton-on-Trent.*** [Mach. B.] [See Advt.

Fire-clay (lump and ground), fire-bricks, terra cotta; Sykes' patent joint pipes for gas, water, and sewage.

- 114 British Fuller's Earth Co., Limited (The), *Woburn Sands, near Bletchley Station, Buckinghamshire.*** [See Advt.

Fullers' earth in its crude and manufactured state.

- 115 Farnley Iron Co., Limited, *Farnley Works, Leeds.*** [See Advt.

Products of Farnley minerals, specimens of Farnley "best Yorkshire iron"; products of Farnley fire-clay, and enamel-glazed bricks, porcelain baths, washtubs, and other sanitary articles.

- 116 Fuller's Earth Mining Co., Limited (The), *Woburn Sands, Buckinghamshire.***

Samples of fuller's earth, pure crude, dried lump, and powdered in various grades of fineness.

- 117 Fuller's Earth Union, Limited (The), *24 Budge Row, London, E.C. Mines and Works: Nutfield and Redhill, Surrey; Coombe Hay Wellow and South Stoke, near Bath, Somerset.*** [See Advt.

Yellow drab and blue Surrey and Somerset Fuller's earth in lump and powder of various grades, also specially refined and oleagated for toilet purposes.

- 118 Lower Lansalson China Clay (Kaolin) Co. (The), *St. Austell, Cornwall. Agents for Canada and the United States: J. Duncan MacFarlane & Co., 180 St. James Street, Montreal, Canada.***

English china clays (Kaolin) brand L L.

- 119 Martin Brothers, Limited, *20 Lockyer Street, Plymouth, Devonshire.*** [See Advt.

China clay for paper-making, bleaching and fine porcelain; fire-bricks for blast furnaces and gas works.

120 Nixey, W. G., 12, Soho Square, London, W.

Refined black lead, Jubilee round lead, Berlin black, "Cervus" knife polish, "Cervus" flour emery, "silver moonlight plumbago" stove polish.

121 Price, J. R. Lloyd, Rhwlas, Bala, North Wales.

Granular and powdered earth, both blue and yellow.

GROUP XLVII.**LIMESTONE, CEMENTS, AND ARTIFICIAL STONE.****122 Albion Portland Cement Co., Limited (The), Greenhithe, Kent,**

Portland cement in casks, also briquettes, broken and unbroken. of the material.

123 Barron & Co., F. C., 9 St. Mildred's Court, Poultry, London, E.C. Works: Falcon Cement Works, Rainham, Kent.

Portland cement.

124 Francis & Co., Limited, Bridge Foot, Vauxhall, London, S.E.

[See Advt.]

Samples of cement manufactured and partially manufactured. whiting, specimens of different kinds of work done in cement, photographs of various lighthouses and other important works; cement casks, testing tools (Michele's patent), automatic cement-testing machine.

125 Gibbs & Co., Limited, Grays, Essex; London Office: 79 Mark Lane, E.C.

Thames Portland cement.

126 Irish Portland Cement and Brick Co., Limited (The), First Lock Works, Grand Canal, Dublin.

Limestone and shale, Portland cement clinker, finished Portland cement, Portland cement briquettes, facing, and stock and ornamental bricks, tiles; sundry earthenware.

127 Patent Adamant Stone Co., Limited (The), 101 Leadenhall Street, London, E.C.

Artificial paving and building stones.

Flynn & Co. See GROUP XLIV.

GROUP XLVIII.

SALTS, SULPHUR, FERTILIZERS, PIGMENTS, MINERAL WATERS, AND
MISCELLANEOUS USEFUL MINERALS AND COMPOUNDS.

128 Ashton & Sons, Nicholas, *Central Chambers, South Castle Street, Liverpool. Agent in New York: Francis D. Moulton, 29 Broadway.*

Ashton's "F. F." dairy, table, and other salts.

129 Higgins & Co., Thomas, *33 Tower Buildings, Liverpool. Agent in New York: Francis D. Moulton, 29 Broadway.*

"Eureka" dairy, table and other salts.

130 Salt Union, Limited (The), *Winsford and Northwich, Marston, Middlewich, Wheelock, Lawton, Sandbach, Wharton Point, Cheshire; Stoke Prior and Droitwich, Worcestershire; Port Clarence and Haverton Hill, Durham; Weston, Staffordshire; and Carrickfergus, co. Antrim, Ireland. Registered Offices, Salters Hall Court, London. Agents in New York: Francis D. Moulton, 29 Broadway.* [See Advt.

White and rock salts (agricultural, chemical, dairy, fishery, factory-filled, table), "Verdin," "Worthington" and other brands.

See fertilizers and compounds, GROUP XVII.

See mineral waters, GROUP X.

See pigments, GROUP LXXXVIII.

United Alkali Company, Limited. See GROUP LXXXVII.

GROUP XLIX.

METALLURGY OF IRON AND STEEL, WITH THE PRODUCTS.

131 Jessop & Sons, Limited, William, *Sheffield.*

Specimens of steel in bars, sheets, castings, and forgings, steel plates for circular and other saws, bands for band saws, fractures of bars showing various tempers of tool steel, Swedish blister steel.

132 Low Moor Company, Limited, (The), near Bradford, Yorkshire.
[See Advt.]

Ironstone, coal, pig, refined, puddled and finished iron, samples small wire, dished plates and twisted bars, rivets various sizes others tested, axles bent cold, sections of angles, tees, channels and other bars, locomotive dome, Galloway's tubes, manholes and valve seats, expansion rings, welders' angle rings, fire-box plates, loco-crank axle, straight, engine and carriage axles, crank pins, piston rods, and staybolt iron tested.

Brindle, Reade and Taylor. See GROUP LXXII.

Farnley Iron Co., Limited. See GROUP XLVI.

Gasking Patent Belt Co. See GROUP LXIX.

Musselburgh Wire Steel Works. See GROUP LXXXV.

United Alkali Co., Limited. See GROUP LXXXVII.

GROUP LI.

COPPER AND ITS ALLOYS—METALLURGY.

Smith & Sons, Sydney. See GROUP LXIX.

United Alkali Co., Limited. See GROUP LXXXVII.

GROUP LIV.

METALLURGY OF ANTIMONY AND OTHER METALS NOT SPECIFICALLY CLASSED.

**133 Johnson, Matthey & Co., Limited, Hatton Garden, London,
E.C.** [See Advt.]

Platinum, and platinum apparatus, rare and precious metals, especially of the platinum group.

GROUP LV.

EXTRACTION OF GOLD AND SILVER BY MILLING.

Coward, W. H. See GROUP LXIV.

GROUP LVI.

EXTRACTION OF GOLD AND SILVER BY LIXIVIATION.

Johnson & Co., S.H. *See* GROUP LXIX.

Lorrain, James. *See* GROUP CXXVIII.

GROUP LVIII.

QUARRYING AND WORKING STONE.

See GROUP LXXVIII.

GROUP LIX.

PLACER HYDRAULIC AND "DRIFT" MINING.

Macfarlane, Strang & Co., Limited. *See* GROUP LXIX.

GROUP LX.

TOOLS AND APPLIANCES OF UNDERGROUND MINING, TIMBERING,
AND SUPPORTING.

See also exhibits in GROUP LXVII.

GROUP LXI.

BORING AND DRILLING TOOLS AND MACHINERY, AND APPARATUS
FOR BREAKING OUT ORE AND COAL.

134 Bickford, Smith & Co., Limited, *Tuckingmill, Cornwall; St. Helen's Junction, Lancashire.*

Safety fuses for blasting, igniters with instantaneous fuses for simultaneously blasting any number of charges without electricity, colliery fuse and safety lighters for fiery mines.

Hornsby & Sons, Limited, Richard. *See* GROUP LXIX.

GROUP LXII.

PUMP ENGINES AND APPARATUS USED FOR PUMPING, DRAINING, AND
HOISTING.

Wade, J. Armytage. *See* GROUP LXIX.

GROUP LXIII.

MOVING, STORING, AND DELIVERING ORES, COALS, &c.

Cradock & Co., George. *See* GROUP LXXXI.

GROUP LXIV.

APPARATUS FOR CRUSHING AND PULVERIZING.

136 Coward, W. H., *Railway Iron Works, Bath.*

Niagara mill for crushing gold quartz and hard ores.

Davies & Sneade. *See* GROUP LXXVIII.

Hornsby & Sons, Limited, Richard. *See* GROUP LXIX.

GROUP LXVI.

ASSAYING APPARATUS AND FIXTURES.

Johnson, Matthey & Co., Limited. *See* GROUP LIV.

GROUP LXVII.

HISTORY AND LITERATURE OF MINING AND METALLURGY.

See also methods of ventilating, GROUP LX.

See also systems of boring, GROUP LXI.

Brown Brothers. *See* GROUP CLI.

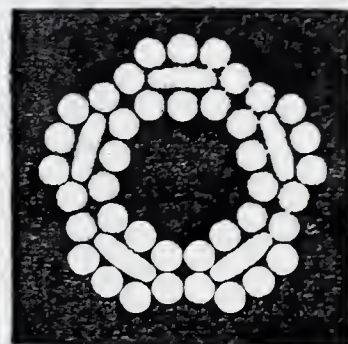
LATCH & BATCHELOR, LTD.,

Wire Drawers,

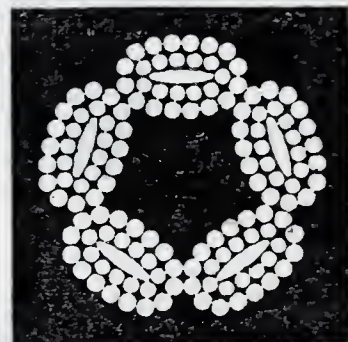
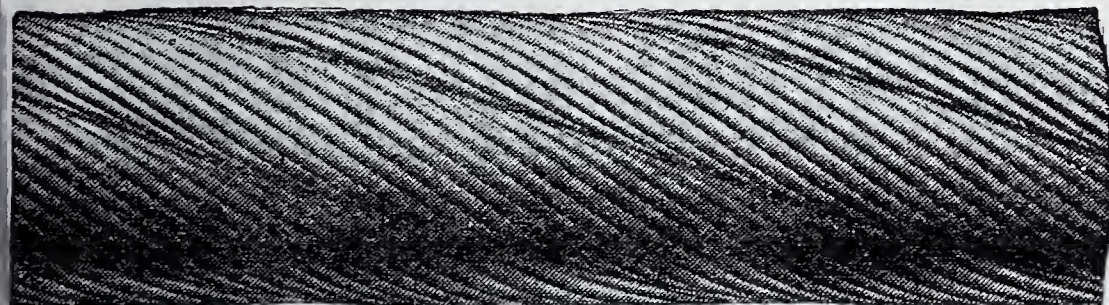
Manufacturers of all classes of **WIRE ROPES** for all purposes.

Patentees of **FLATTENED STRAND ROPES**,
Which have 150 per cent. more wearing surface than "Langs Lay" or ordinary Ropes.

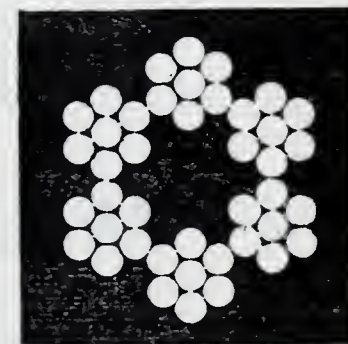
PATENT FLATTENED STRAND ROPE.



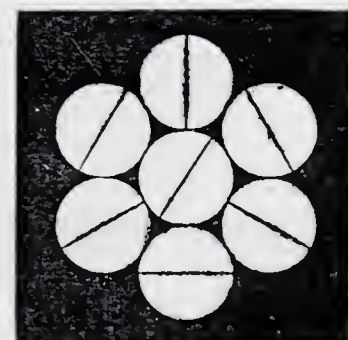
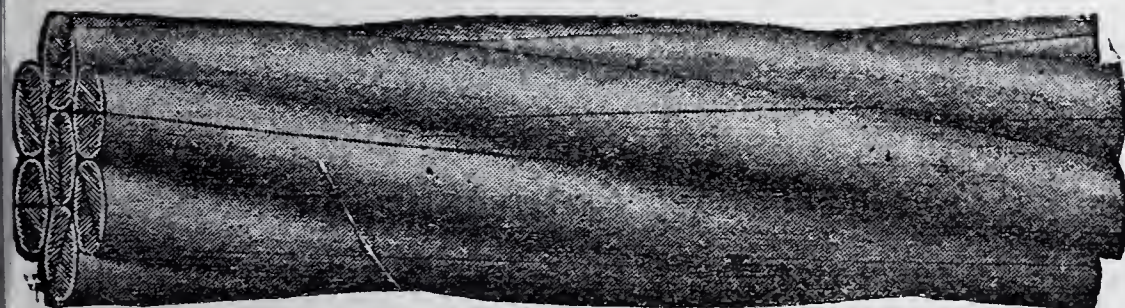
PATENT FLATTENED STRAND ROPE.



"LANGS LAY" OR ORDINARY ROPE.



LATCH & BATCHELOR'S PATENT SAFETY GUIDE CONDUCTOR OR AERIAL TRAMWAY ROPE.



HAY MILLS, NEAR BIRMINGHAM, ENGLAND.

TELEGRAPHIC AND CABLE ADDRESS—"LATCH, SOUTH YARDLEY."

SAMUEL LAWSON & SONS, LEEDS, ENGLAND.

Makers of MACHINERY for

**PREPARING AND SPINNING FLAX,
TOW, HEMP AND JUTE,**

AND OF

**SPECIAL MACHINERY FOR THE
MANUFACTURE OF TWINES.**

Good's Combined Hackling and Spreading Machine.

AUTOMATIC SPINNING FRAMES.

Improved Laying Machines.

And other SPECIAL MACHINERY for the MANUFACTURE
OF ROPE YARNS.

Brownell's Patent Twisting and Laying Machines for Twines.

COUNCIL MEDAL, LONDON, 1851.

GRAND MEDAL, PARIS, 1867.

PRIZE MEDAL, MOSCOW, 1872.

DIPLOMA OF HONOUR, VIENNA, 1873.

HIGHEST AWARD, PHILADELPHIA, 1876

GOLD MEDAL, PARIS, 1878.

HIGHEST AWARD (MEDAL), MELBOURNE, 1880.

Department J.

MACHINERY.

BY H. GRAHAM HARRIS, M. INST. C.E., M. INST. M.E.

In reviewing the development of machinery, generally, during the past few years, it is found that the tendency is towards the specialisation of machines—that is to say, towards the production of machines specially designed and constructed, so as to perform one set of functions in the most economical and best possible manner.

This tendency, while it is, perhaps, most noticeable in machinery for the production of articles of which large numbers are required, also prevails in the steam engine and other “prime movers.”

High-speed steam engines for the driving of dynamos, coupled direct to the crank-shafts, these engines being mostly of the vertical type, with overhead cylinders, are trade articles with many British firms of eminence, who devote a large proportion of their facilities and energies to this manufacture.

The piston speeds in these engines are moderately high, and the steam cylinders are of large diameter as compared with the stroke. In order to develop to the full in them the advantages to be derived from high steam boiler pressures, and to obtain greater regularity of turning effort, these engines are made with two or three steam cylinders and compound, or triple expansion.

In the former case the cranks are usually placed at right angles, and in the latter at equal angles. Such engines are, to a large extent, built on the lines which have now for years been adopted by the manufacturers of marine engines for torpedo, and other light high speed steamers.

Long stroke horizontal engines, either compound or triple expansion, with high piston speeds, but running at comparatively few revolutions per minute, the steam admission to the cylinders being governed by some sort of “trip” or “cut-off” gear, such as the Corliss or the Collmann, are specialities with many manufacturers, these engines being employed for driving mills or for other such purposes, where the large amount of ground space they occupy is not

a disadvantage, and where steady running with economy in fuel consumption are important.

Direct-acting pumping engines, such as the Worthington or the Davey differential engine, or such as the duplex direct-acting pumps, where the piston of one of the two steam cylinders works the slide valve of the other, are rapidly replacing the old-fashioned beam pumping engine. In these direct-acting engines the steam-piston and pump-plunger speeds are slow, and the number of strokes per minute are few, the engines in their best forms being provided with very effective expansion gear.

Efforts still continue to be made to increase the economy of the steam engine generally, not only by paying more attention to the design and proportions for special purposes and special work, but by adopting the steam-jacket, or probably some form of superheating for the steam before it enters the cylinders, and also by the use of some form or other of condensation with higher pressure steam used successively in two, three, or sometimes even four, cylinders, these higher steam pressures necessitating, however, much greater care in the construction and design of the various parts of the engines themselves and in the boilers.

Until very recently, "Lancashire," or internally fired, boilers were looked upon with suspicion for high pressures, with the result that the water-tube boiler, in spite of its many disadvantages, was frequently preferred, this form of boiler having, as was supposed, an advantage over the Lancashire boiler, in that the working pressure could be rapidly generated in it in cases of sudden demand, such as arise in the running of electric light stations. But a study of the subject has demonstrated that for such purposes Lancashire boilers with cross Galloway tubes in the flues are thoroughly efficient, and that this is the best form to adopt, and it is difficult to conceive a more satisfactory method of Heat Storage—to meet excessive demands for brief periods—than is afforded by the large quantity of heated water which such boilers contain. Thus, Lancashire boilers working at pressures up to 150 or 170 lbs. on the square inch, and as much as 7 feet 6 inches in diameter, are now becoming common.

In the case of the marine boiler, pressures of 150 lbs. on the square inch are frequently used; in fact, higher pressures have been employed in the ordinary return-tube marine boilers having diameters

of 17 feet 6 inches, with shell plates $1\frac{9}{8}$ inch. thick. The use of mild steel for such plates, treated in special machines for flanging, drilling, planing, and bending, has enabled this progress to be made ; and such machines are now to be found in the factories of all the best boiler makers, their use not only cheapening the manufacture, but ensuring that the work turned out, is in every way superior to that produced, under the old conditions, by hand.

The great rival of the steam engine—the gas engine—is rapidly developing ; and now that the original patents have lapsed, many large firms have commenced the manufacture, and are entering upon it with the energy for which they are noted.

In this form of “prime mover” the tendency is to increase to very large sizes, as compared with those deemed possible some few years since. The difficulties attendant upon starting the large engines have been overcome, and there are now two or three forms of “starters,” either of which is satisfactory.

Gas engines developing in a single cylinder as much as 50 to 80 horse-power have been running for many months. The results obtained with these are such as to justify the very great steps in advance which are now being taken ; for engines indicating as much as 375 horse-power in the two cylinders are under construction by Messrs. Crossley Bros., who have done so much for the gas engine industry in England.

These large size engines are commonly of the twin type—that is to say, the power is produced in two cylinders ; and, up to the present, the “Otto” cycle is the one most commonly used ; in fact, almost all makers are now adopting this cycle, or some modified form of it.

The fuel consumption in the best of these engines, especially when Dowson or other “producer gas” is used, has for years past been considerably below that of the most economical form of steam-engine ; but the complication of the gas engine and its high initial cost have, up to the present, retarded the development of this “prime mover.”

With the keen competition now prevailing in the gas engine business, prices will of necessity be low ; and, as in addition, efforts are being made to simplify in every possible way the design and manufacture of these engines, the probabilities are in favour of a further reduction in the price, with consequent increased progress.

In petroleum engines a similar advance is to be observed. These engines are of more recent development than the gas engine, but, in spite of this, a considerable number are in use.

A petroleum engine—whether as a fixed engine for factory or electric lighting purposes, or as a marine engine, or as a portable engine carrying its own store of fuel—is now a recognised practical and commercial success, and that up to some 25-horse-power produced in one cylinder.

In many places the practical advantages of the petroleum engine are so pronounced as to preclude the use of any other form of motor. As a portable engine, or as a traction engine for farm purposes, carrying with it a week's supply of its own fuel and its own cooling water, it trenches very seriously on the domain of the steam-engine; and although as yet there is no petroleum engine which can compare in size with the larger gas engines, yet the tendency is to increase the size of these motors and the power developed by them.

Some further experimental researches are necessary before this development can be successfully carried out; but these experimental researches are in the hands of the various eminent firms engaged in the manufacture, and they may be trusted to bring them to a successful issue.

The former difficulties in connection with the ready vaporization of the oil and the clogging of the ports have, to a large extent, been overcome by minor devices introduced as a result of continued experience in the working; and there seems no reason why it should not be possible, within a very short time, to produce engines, using liquid fuel direct, from which shall be obtained, in a single cylinder, horse-powers much in excess of those now to be had. No complete concurrence of opinion as yet appears to be arrived at as to the best method of vaporization and of dealing with the oil, or as to the exact "cycle" to be used—though probably the "Otto Cycle" is the most common—but many different types of engine are being made, and the most practical form is sure to survive.

The fuel consumption in the best of these engines is already very low, and this no doubt will be considerably decreased as their design and working come to be more fully and generally comprehended.

In the naphtha or spirit vapour engine, which some few months ago appeared to be coming into use for small powers, and for

employment in open boats, no important progress is now to be noted. The probabilities in respect of such engines are that they will be most satisfactory when used for small sizes only, as the theoretical difficulties attendant upon the production of power by this means, with the further difficulties arising from the use of so volatile and inflammable a spirit, will render large engines impracticable.

The use of petroleum for fuel purposes is steadily progressing, principally in the direction of rivet and plate heating in boiler works and ship and bridge building yards. Here its cleanliness, and the great heat which can readily be obtained from it, render it extremely valuable. It is also being used, in combination with solid fuel, in some of the locomotives of the Great Eastern Railway, with satisfactory results. In Russia it is being employed alone for similar purposes, and also alone in the boilers of certain lines of their steamships.

Many projects for the transmission and sale of power have been mooted, such as the use of gas, compressed air, steam, electricity, and water, and some have been experimentally adopted ; but, omitting gas, no one of these has so far been as commercially successful as the transmission hydraulically. In London, Liverpool, and Hull the use of power-water is making steady, but sure and satisfactory, progress, and new developments are continually arising. Birmingham has an installation, and Manchester is now busily engaged upon a similar scheme, while in other of our large towns it is constantly being advocated.

In machinery for the production of war material the improvement has not been very marked ; but, such as it is, has again been in the direction of specialisation.

Machines capable of performing only one operation, but performing that operation to perfection, have been designed and constructed, and are doing successful work. More especially is this the case where, as in "small arms" or in the "cartridges" for these, millions of articles or pieces, all of absolute similarity, have to be produced. This tendency is to be found, however, not only in machines for such work, but throughout the whole range of machines up to the largest lathes, employed in the boring of the heavy guns which we now adopt. For smaller work the "emery grinder" and the "milling machine" are the favourite tools. The issue of the

magazine rifle to the British army within the last few months has directed much attention to these machines, with consequent advance in their development.

In the production of the original steel forgings for the manufacture of big guns, crank-shafts, and other heavy masses, pioneer work has been done by some of the larger firms, in producing, for their own use, hydraulic forging-presses, some of these being of gigantic dimensions, and capable of exercising enormous pressures upon the heavy masses which have to be shaped.

In this department of hydraulic engineering, but for smaller work, other machine makers have produced, for sale, extremely useful and handy forging presses of small size. A large demand for machines of this character has sprung up, and the "old-fashioned" (as it may now be called) steam hammer will probably, within a little time, lose the pre-eminence it once had in the forging shop.

In the case of machines employed in ship-building and bridge-building yards, in riveting machines for the direct riveting up of work in place, in punching and shearing machines—in fact, in all the general machines to be found in these works—the tendency to specialise is very noticeable, and power supplied from a central hydraulic or compressed-air plant is being largely employed.

The production of shop shafting, couplings, bearings, hangers and pulleys—the latter all in mild steel, wrought iron, or wood—is another speciality being carried on by manufacturers who devote themselves entirely to such work. In this particular direction much has been learnt from the United States.

The recent developments of tunnel construction, whether subterranean or sub-aqueous, have led to the invention of many ingenious devices designed with the object of enabling difficult strata—gravel or sand filled with water—to be pierced with perfect safety and certainty; and these special machines have allowed of extremely difficult works of this character being brought to a successful conclusion.

In the department of agricultural machinery, no notable and striking advances have been made, with the exception of the continued improvement in reapers with "string binders," or as is now possible "straw binders." But machines generally are better designed, constructed, and yet cheaper than they were, and are also

more efficient in the work they perform. Complete steam-driven creameries, with "milk separators" and power-driven "churns" and "butter-workers," are becoming common.

In milling, the "old-fashioned" mill-stone is rapidly giving place to rollers. In these roller mills the grain is passed through a succession of pairs of rollers, the rollers in each successive pair being placed slightly nearer together than the preceding pair, so that the grain is gradually "reduced" by roller pressure, and between each pair of rollers the product is dealt with by currents of air of greater or less strength, thus continually "purifying" and "grading" the size or particle.

The enormous development which has taken place in the trade of frozen meat has been the governing factor in the progress of machinery for the "production of cold artificially," and, as a result, there are many cold-producing machines, using various refrigerating agents, some of them being of very great excellence of manufacture and economy in working.

For the original freezing, however, and for transport purposes on board ship, the air refrigerating machine appears to be preferred, as it does for the preservation of other perishable articles of food, and this in spite of its comparatively heavy fuel consumption.

Efforts are being made to introduce (and some of these efforts have been so far successful) the various ammonia machines on board ship, and also the machines wherein carbon anhydride is the refrigerating agent. What the final result of these efforts will be, it is impossible to say, but there is no doubt that their adoption would lessen the coal bill considerably.

The importance of this trade will be realised when it is stated that one of the largest firms engaged in it in London alone exported last year something like one million and a quarter of sheep, the majority of these coming from New Zealand, and each having a value (roughly) of one sovereign.

Australia, however, with its far larger flock of sheep than is possessed by New Zealand, is embarking in this industry; and there is not much doubt but what the necessities of Australia to get rid of her produce will tend to a further and important development in this business in the near future.

Special forms of apparatus for moving the large quantities of sheep (thus replacing the hand labour hitherto employed) are now

engaging the attention of those interested, the apparatus being employed in unloading from the "ship" to the "barge" or "lighter," or *vice versa*, and also from these into the warehouse or "cold store," and from the latter to the van for delivery to market or to the customer.

The machines consist of endless travelling chain ladders, and are similar in principle to the special elevators used for the continuous delivery of casks, bales, or other similar packages, or similar to the scraper elevators, now largely employed for heaping coal, for storage purposes at coal pits, or at gas works, or for heaping broken stones, cement, or other similar material.

The construction of the Manchester Ship Canal and similar works has caused an important development of floating excavating machines, and of machines for dealing with the vast quantities of material which had to be moved. Special appliances were designed for this purpose, and some of them have been eminently successful, and reflect great credit on the ingenuity and skill displayed by the designers, the manufacturers, and also the users.

Many accidents have lately occurred to the propeller-shafts or crank-shafts of steamers, the one which was probably brought most prominently before the public notice being that of the *Umbria*. What is the predisposing cause of these accidents it is impossible to say, nor is this the place to discuss such a question; but it must be remembered that the manufacture of mild steel for such shafts as these, and for the vast masses which are employed in our big guns has become of the utmost importance, and that, although the greatest of care, of skill, and energy are, and have been, displayed by the various firms engaged in this industry, yet difficulties and uncertainties of manufacture still crop up, concealed flaws in the metal are still incapable of certain detection, and the various ingenious forms of apparatus which have been devised for the discovery of such flaws do not yet appear to be coming into successful practical use.

The engineer hopes these troubles will be overcome, and that sooner or later he will have at his command, mild steel, in which he can be absolutely certain of the internal structure of every piece he employs. Exhibitions such as the one at Chicago will tend to help in solving this and the numerous other problems by which he is confronted, and will thus materially conduce to the benefit of humanity at large.

DEPARTMENT F.

MACHINERY.

Unless otherwise stated, the Exhibits in this Department are in the Machinery Building.

GROUP LXIX.

MOTORS AND APPARATUS FOR THE GENERATION AND TRANSMISSION OF
POWER—HYDRAULIC AND PNEUMATIC APPARATUS.

137 Allin, S. Sealy, 25 *Garlick Hill, London, E.C.*
Vertical water motor.

138 Caddy & Co., Limited, *Daybrook Iron Works, near Nottingham.*
[See Advt.]
Tubular chilled face smoke consuming fire-bars for boilers and
other furnaces.

139 Crees & Company, Limited, *Devizes, Wiltshire.*
Archimedean plate and dish washing, rinsing, racking, and
drying machines.

140 Denny & Co., *Engine Works, Dumbarton, Scotland.* [Transp. B.]
[See Advt.]
Working models of Brock's patent quadruple expansion screw-
propelling marine engines, being those of ss. "Montevideo," be-
longing to the Compania Transatlantica of Barcelona and the steel
screw ss. "Telunga"; working model of compound paddle marine
engines, being those of the ss. "Princesse Henriette," and
"Princesse Josephine," employed in the Dover-Ostend Service
and the property of the Belgian Government.

141 Economic Smokeless Fire Co. (The), 28 *Market Street, Brad-*
ford. [See Advt.]
Leggott and Marsh's patent smoke-consuming and fuel-econo-
mising appliances for steam boilers, cooking ranges, hot-air stoves,
and other fires.

142 Galloways, Limited, Knott Mill Iron Works, Manchester.

Engine driving one of the three lines of shafting running through British Section. (See Complimentary List, page xxxiii, for particulars.)

143 Gasking Patent Driving Belt Co. (The), Enfield, Middlesex.

Machine driving belts of patent "long-slotted steel" and leather links; patent "tongue-pointed" flat leather, and ordinary sewn, cemented, or riveted leather, textile, indiarubber and gutta-percha belting; laces; engine and suction hose, fire buckets; hydraulic pump and other leathers, hides, butts, and various articles used for railway, marine, military, and mechanical purposes.

144 Griffin, John, Bally Macthomas, Cork.

Patent solid woven flat-gut belting.

145 Hodgkinson & Co., Limited, Ordsal Works, Salford, Manchester.

Mechanical stokers and self-cleaning furnaces, marine stokers and self-cleaning furnaces.

146 Hornsby & Sons, Limited, Richard, Spittlegate Iron Works, Grantham.

[See Advt.]

Hornsby-Akroyd patent oil engine; steam or pneumatic rock boring or drilling machine; models of steam engine, stamp battery, and other mining machinery.

147 Johnson, Robert, 55 Athol Road, Bradford.

Drum rotary pump and blower.

148 Johnson & Co., S. H., Engineering Works, Carpenters Road, Stratford, London, E.C.; Franklin Square, and Cherry Street, New York (John Johnson & Co.).

Air compressors, vortex mixers, filter presses, drying machine; apparatus for leaching ores of gold and silver by treatment with chlorination or cyanide process, and for treatment of slimes; oil filters; compressed air syren fog signals.

149 Joy, David, 17 Victoria Street, Westminster, S.W.

[Mfct. G.]

Moving picture models of the "Joy valve gears" in the various forms constructed for marine and locomotive engines,

150 Macfarlane, Strang & Co., Limited, *Lochburn Iron Works, Glasgow; 45 Leadenhall Street, London, E.C.*

Cast iron pipes for water and gas conduction, sluice and air valves, hydrants; "Bonna" water-meters; cast iron railway chairs and sleepers.

151 Mackenzie, H. Somerset, *Penwenack, Falmouth, Cornwall.*

Dual screw steam engine for propelling vessels, with two screws, right and left handed on concentric shafts without gear or belting; also models of vessels and portion of the mechanism showing difference between twin screws and dual; D-shaped double acting and reversing launch steam engine; D-shaped single and double acting pumps.

153 Moncrieff, John, *North British Glass Works, Perth, Scotland.*

Perth gauge glasses, to show height of water in boilers.

154 Parkinson's Condensed Gas Co., *Stretford, Lancashire.*

Pumps; Parkinson's "Zero" exhaustless engine.

155 Phillips, Theo, *Tees Oil Works, Middlesbrough.*

Patent lubricating bags for roll-necks and engine bearings.

156 Ross & Duncan, *Whitefield Works, Govan, Glasgow.*

Surface condensing launch engines, with Bremme's valve gear and Duncan's propeller; model of tug "Wybia" supplied to order of Tasmanian Government for Launceston Marine Board.

157 Smith & Sons, Sydney, *Basford Brass Works, Nottingham.*

All kinds of gun-metal engine and boiler fittings; iron junction safety valves; steam, vacuum, water pressure, mineral water, blast and hydraulic gauges; Smith's patent whistles; Smith's patent full bore cocks; reservoir, well, and water tank indicators; reducing and sluice valves; asbestos-packed cocks and water gauges; stand-pipes; specialities for locomotives, marine, engineering, collieries, mines, and ironworks.

158 Sterne, L, *2 Victoria Mansions, Westminster, London, S.W.*

Gas engines.

- 159 Wade, J. Armytage, Hydraulic Engineering Works, Hornsea, near Hull.** [See Advt. 1]

Helical and other varieties (dredger and otherwise) of centrifugal pumps and their fittings; apparatus for raising stones and other substances without injury to pump; apparatus for indicating and registering power and preventing or lessening shocks to machinery.

- 161 Willans & Robinson, Limited, Thames Ditton, Surrey.**

Two engines driving two of the three lines of shafting running through the British section. Steam dynamo, of 180 kilowatt size, consisting of 300 I.H.P. Willans' compound central-valve engine, coupled direct to a Siemens' Brothers (English made); 2-pole dynamo; speed 350 revolutions per minute. (See Complimentary List, page xxxvi., for further particulars.)

See also filtering apparatus, GROUP CXLVII.

Belfast Ropework Co., Limited. *See GROUP LXXXV.*

Brown & Co., Limited, John. *See GROUP LXXXVI.*

Fairfield Shipbuilding and Engineering Co., Limited. *See GROUP LXXXV.*

Noble, Brown & Co. *See GROUP LXX.*

Tayler & Co., Limited, D. F. *See GROUP LXXXIII.*

GROUP LXX.

FIRE ENGINES—APPARATUS AND APPLIANCES FOR EXTINGUISHING FIRE.

- 162 Haslam Fire Extinguishing Co., Tonge, Bolton.**

Fire extinguishers, and all kinds of fire extinguishing appliances

- 163 Messer & Thorpe, 8 Quality Court, Chancery Lane, W.C., and (works) Gedling Street, Dockhead, S.E., London.**

Patent bucket fire extinguisher.

164 Noble, Brown & Co., Nobro Works, Leeds.

Patent portable and chemical fire engines (worked by the operator's whole weight), patent portable garden and conservatory pumps (worked by the feet), patent portable window and carriage cleansing machine (with self-feeding water brushes), patent portable military shower baths (worked by pedal action), with self-feeding flesh brushes.

Gasking Patent Belt Co. *See* GROUP LXIX.

Smith & Sons, Sydney. *See* GROUP LXIX.

GROUP LXXI.

MACHINE TOOLS AND MACHINES FOR WORKING METALS.

165 Massey, B. & S., Openshaw, Manchester.

Steam and power hammers, sawing machines for metals, forging machines.

166 Square Drilling Machine Co., Limited, 100c Queen Victoria Street, London, E.C.

Patent angular drilling machine to drill round, square, oblong, flat-sided, hexagonal, octagonal and other angular-shaped holes.

167 Wright & Sons, Peter, Constitution Hill Works, Dudley.

[*See* Advt.]

Patent solid wrought anvils, bick face and end in one solid piece; patent wrought iron parallel vice, patent leg vices with solid wrought box and pin; steel smiths' tools, and all kinds of hammers.

See also exhibits in GROUP LXXVIII.

See also hand tools, GROUP CXIX.

GROUP LXXII.

MACHINERY FOR THE MANUFACTURE OF TEXTILE FABRICS AND CLOTHING.

- 168 Brindle, Reade & Taylor, 14 *Field Street, Failsworth, near Manchester.*

Spinning frame for spinning cop on the bare spindle and on permanent frame, clip and arrangement to ensure steady winding and better cop with ordinary mules, automatic shuttle guard for power looms; pressure fans for cotton mills, also applicable to blast furnaces.

- 169 Cameron-Maclachlan, Dugald, *Oban, Argyllshire, Scotland.*

Hand loom, and spinning wheel.

- 170 Crippin, William, and Young, George, 48 *Faulkner Street, Manchester.*

Dyeing of rovings and cops in cotton and wool.

- 171 Grant & Co., W. H., *Foleshill, Coventry.*

Jacquard silk weaving loom with six tiers of shuttles, in motion, small hand loom for silk handkerchiefs, ties, and similar goods, sundry accessories and small machines.

- 172 National Machine Syndicate (The), 8 *Hart Street, Wood Street, London, E.C.*

Machines for marking and measuring, and blocking textile and other fabrics.

- 173 Platt Bros. & Co., Limited, *Hartford Iron Works, Oldham.*

[See Advt.]

Cotton cleaning, carding, and combing machinery.

Cotton bale breaker, with mixing lattices, exhaust opener, and lap machine, 48 inches wide, with lattice feeder and patent dust trunks; single scutcher and lap machine, 46 inches wide; single carding engine, 45 inches, on wire, 50 inches cylinder; 106 self-stripping flats, drawing frame, head of 2 deliverers, lap doubler; Heilman's combing machine, 8 boxes, laps 10½ inches wide.

- 174 Roberts, Royle & Co., *Victoria Works, Lilly Street, Urmston, Manchester.*

Light power loom for making fancy coloured goods.

175 Stevens, Thomas, *Stevengraph Works, Coventry.*

Jacquard figure loom.

176 Wilkinson, Thomas, *Paynes Lane, Coventry.*

Loom with double cylinder Jacquard machine for weaving broad and narrow silk and cotton fabrics.

Combe, Barbour & Combe, Limited. *See GROUP IX.*

GROUP LXXIII.

MACHINES FOR WORKING WOOD.

177 Shaws, Limited, 32 *Hanover Street, Manchester.*

Brush boring machines (Shaw and Ditchfield's patent); materials used in the manufacture of brushes.

GROUP LXXIV.

MACHINES AND APPARATUS FOR TYPE-SETTING, PRINTING, STAMPING, EMBOSSING, AND FOR MAKING BOOKS AND PAPER WORKING.

178 Byers & Co., Joseph J., 40 *King Street, Cheapside, London, E.C.*

Improved Feister printing machine—cutting, printing, collecting, pasting, folding, and counting; articles of pergamoid printed on direct.

179 Caslon & Co., F. W., *The Caslon Letter Foundry, 22 & 23 Chiswell Street, London, E.C.* [Mfct. G.]

Specimen books of printing types, and of brass types, and ornaments for bookbinders.

180 Hilder, Charles F., 33 *Holborn Viaduct, London, E.C.*

The "Ideal" type distributing, composing and justifying machines, together with racks for holding types, arranged to show adaptability of machines for distributing and composing any fount of ordinary type (English and American standard), from pica to pearl (no special nicking being required); mechanism operated by keys similar to those used in best forms of typewriters.

Hare & Co., Limited. *See GROUP CL.*

GROUP LXXV.

LITHOGRAPHY, ZINCOGRAPHY, AND COLOUR PRINTING.

- 181 **Cyline Manifold Copying Machine Co. (The)**, *Highfield Works, Upper Kent Street, Leicester.*

Cyline zinco-litho machine, a lithographic machine in which a zinc plate stretched upon a cylinder is used as a substitute for stone, having special inking, damping, and delivering movements.

Hare & Co., Limited. *See* GROUP CL.

London Colour Printing Co. *See* GROUP CL.

GROUP LXXVI.

PHOTO-MECHANICAL AND OTHER MECHANICAL PROCESSES OF ILLUSTRATING, &c.]

Barlow & Jones, Limited. *See* GROUP CII.

Hare & Co., Limited. *See* GROUP CL.

London Fabric Printing Co. *See* GROUP XC.

Turnbull & Stockdale. *See* GROUP CII.

GROUP LXXVII.

MISCELLANEOUS HAND-TOOLS, MACHINES, AND APPARATUS USED IN VARIOUS ARTS.

- 182 **Allin, S. Sealy**, 25 *Garlick Hill, London, E.C.*

Automatic refreshment stall, delivering hot tea and coffee, cool drinks, effervescent, biscuits, sweetmeats, for use in factories, streets, parks.

- 183 **Davies Bros. & Co., Limited**, *Crown Works, Wolverhampton.*

Samples of articles made by Davies' patent automatic galvanising process, and illustrations of the machinery in operation.

- 184 **Doulton & Co.**, *Lambeth Pottery, London, S.E.; Burslem, Staffordshire.* [Mfct. B.] [See Advt.]

Selection of stoneware vessels and apparatus for chemical purposes, and for the preparation of explosives, including a stone jar for acids of 650 gall. capacity, plumbago crucibles.

35 Hudson, C. & J. S., *Dovecot Street, Stockton-on-Tees.*

Wall paper trimming and pasting machine, label pasting and gumming machine.

36 Waterforce Laundry Machine Co., Limited (The), 150 *Leadenhall Street, London, E.C.*

Steam power washing machines.

See also exhibits in GROUPS XLV. and LXIX.

See also hand tools, GROUP CXIX.

Francis & Co., Limited. *See* GROUP XLVII.

Johnson, Matthey & Co. *See* GROUP LIV.

Shaws, Limited. *See* GROUP LXXIII.

GROUP LXXVIII.

MACHINES FOR WORKING STONE, CLAY AND OTHER MINERALS.

8 Fawcett, Thomas C., *Whitehouse Engineering Works, Hunslet Road, Leeds.* [See Advt.]

Patent compound brick making and pressing machine, for making plastic pressed bricks at one operation; red facing, fire bricks and glazed bricks; patent brick and tile pressing machine, for repressing plastic or dry bricks, tiles, hand-made bricks, or clots of clay, into best pressed facing bricks or tiles.

9 Knowles, Henry, 18 *New Bridge Street, Blackfriars, London, S.E.* [See Advt.]

Direct action kilns and ovens (models) for burning bricks, pipes, tiles, terra cotta, pottery, lime, cement; samples of goods burnt in the kilns; "Paragon" and Sykes' pipes for gas, water and sewerage.

10 Royle & Co., Joseph, 131 *Tennant Street, Birmingham.*
Sand blast machines.

191 Tilghman's Patent Sand Blast Co., Limited, Bellefield Works, Sheffield.

Mathewson's patent sand blast apparatus for engraving, lettering, perforating, frosting, or cleaning glass, stone, metal.

See also exhibits in GROUP LXXI.

Phillips, Theo. *See GROUP LXIX.*

GROUP LXXIX.

MACHINERY USED IN THE PREPARATION OF FOODS, &c.

192 Baker & Sons, Joseph, 58 City Road, London, E.C.

[*See Advt.*]

Complete plant of machinery for biscuit making, for plain and fancy bread, cake, and pastry making and flour confectioners, with continuous baking ovens; for sweet confectionery (including lozenges and sweets), and chocolate making; for ice cream making with refrigerators; automatic tea and coffee extractors, urns, and fittings.

193 Davies & Sneade, Charter Street, Vauxhall Road, Liverpool.

Millstones for rice shelling, hulling, and grinding; millstones built on firm's patent system, for grinding maize, phosphates and cements, also minerals and quartz.

194 Johnston, James, Thorp Street Mill, Macclesfield, and 4 Corporation Street, Manchester.

[*See Advt.*]

Patent combined steam and hot air oven; dough kneading sponge mixing, flour sifting and blending, and dough dividing machines, break for rolling paste, whisk, and cake beater.

195 Werner and Pfleiderer, 117 Queen Victoria Street, London, E.C.

Various machines, ovens, brakes, presses, and hand tools used in trades where mixing, kneading, baking, masticating, drying, triturating, whisking, and stirring is carried on.

See dairy appliances, GROUP VII.

See preparation of beverages, GROUP XIII.

Flynn & Co., Thomas M. H. *See GROUP XLIV.*

Johnson & Co., S. H. *See GROUP LXIX.*

Department G.

TRANSPORTATION—RAILWAYS, VESSELS, VEHICLES.

SHIPS AND SHIPPING.

BY FRANCIS ELGAR, LL.D., M. INST. C.E.

Late Professor of Naval Architecture, Glasgow University.

The century that is now in its last decade has been remarkable for many mechanical improvements, but for none more than the change it has witnessed in the mode of transport by sea. The modern invention of the steam engine has superseded wind—the propelling power from time immemorial in ocean navigation. The application of this new power has been developed and extended with marvellous rapidity and success, so that we now have ships travelling from one part of the world to another with a speed and regularity that were formerly undreamt of. During the same brief space of time iron and steel have been substituted for wood as the material of construction for the hulls of ships ; and vessels have, by these means, been produced whose dimensions and proportions would have been otherwise unapproachable.

At the close of the first third of the present century the oversea trade of the world was carried on with ships that were all built of wood, and were propelled by sails. Only about 200 of these were over 500 tons in burden, or much more than 100 feet long. At the present day there is not a ship being built of wood in the United Kingdom for any oversea trade, nor one for any coasting or river trade, except the very smallest craft.

The total number of vessels registered at ports in the United Kingdom at the end of 1891 was 21,189, and their gross tonnage amounted in the aggregate to 8,246,700 tons. 13,500 of these were sailing ships, whose gross tonnage was 2,944,693 ; and 7,689 were steamers, whose gross tonnage was 5,302,007. About one million tons gross register of shipping per annum is being built in the ship-

yards of the United Kingdom for British owners, more than 20 per cent. of which is sailing tonnage, and 98 per cent. of which is built of steel.

The rate of development that has taken place in the size and power of steamships since they first came to be regularly employed in ocean navigation—which is since the date of Her Majesty's accession—can be well illustrated by reference to the earliest and the latest steamers of two of the oldest British steamship companies. The first steamer despatched with mails by the present Peninsular and Oriental Steam Navigation Company was named *Iberia*. She commenced the mail service in 1837 to the Spanish Peninsula. The *Iberia* was a wooden paddle steamer of 516 tons gross measurement and 180 indicated horse-power. The steam pressure was 7 lbs. per square inch, and her speed was about 8 knots. From this small beginning the P. and O. Company has extended its operations to India, China, Japan, and Australia, and is now employing steamers of 7000 tons gross register tonnage and 10,000 indicated horse-power, with a steam pressure of 160 lbs. per square inch, and a maximum speed of over 18 knots.

Passing from the P. and O. Company in the east to the Cunard Steamship Company in the west, the Mail Service from England to America was commenced three years later by the latter Company in 1840 with four wooden paddle-steamers, named *Britannia*, *Acadia*, *Caledonia*, and *Columbia*. These ships were 207 feet long on the water-line, 34 feet 4 inches in breadth, and had a displacement of 2,000 tons. Their gross tonnage was 1,156. The indicated horse-power of the engines was about 740, the boiler pressure 9 lbs. to the square inch, the consumption of coal per day about 40 tons, and the average speed $8\frac{1}{2}$ knots. The latest ships of the Cunard Company, the *Campania* and *Lucania*, are nearly three times the above in length, nearly twice the breadth, and have nearly twenty times the displacement. The engine power is thirty-five times the above, and the speed two-and-a-half times. The coal consumption will only be about twelve times that of the earliest steamers, although the engine power is increased by about thrice twelve times.

Steamships have been improved in many directions besides those of size and speed. The material of construction has been changed from wood to iron, and later from iron to steel. The type of the propelling machinery has been changed from simple expansion

engines of the side-lever type and jet condensers, with flue boilers of rectangular form, carrying steam at a pressure of 7 lbs. per square inch, to triple expansion direct-acting engines and surface condensers, with cylindrical tubular boilers carrying steam at pressures of 160 to 180 lbs. per square inch. The rate of consumption of coal, which was about 9 lbs. per indicated horse-power per hour when the first P. and O. steamer *Iberia* was built, and was 5 lbs. in the first Cunarders, has now been brought down to about one-third the latter amount. The form of propeller has been changed from the paddle-wheel to the screw; and now twin screws are being introduced into passenger steamers of the highest class. Twin screws have, in some cases, forced themselves into acceptance, when the power required of the engines was so great that a division of the propelling machinery into two sets was necessary in order to bring the cylinders and other parts within manageable proportions; and they have long been used in war-ships, where it is an object to prevent a total loss of propelling power in the event of a portion of the machinery being injured. They are also now being fitted in ships where the above are not governing considerations. This duplication of the propelling machinery prevents a loss of all propelling power by the breaking of a shaft, or of any other part of the machinery; and, when the two engines are placed in separate engine-rooms, as is usually done, an injury to the engine-room, by collision or other accident, would not be likely to prevent the engines in the other compartment being worked. It seems to be only a question of time for the travelling public to realise the security against a total breakdown of all propelling power which twin screws give, and for the system to be introduced into all new passenger steamers.

The system of dividing the propelling power has been carried still farther in France and America, where ships are being built with three sets of machinery and triple screws.

The efficiency of the subdivision of steamships of all classes into watertight compartments has been much increased during recent years, and has reached a point, in the latest passenger steamers, where real security would be afforded in the event of a collision or other disaster to the hull. The bulkheads have been made more numerous and have been considerably strengthened.

Steam and hydraulic power has superseded manual labour in

the various details of the internal working of a ship—such as the steering, raising and lowering the anchors, loading and discharging cargo, pumping, ventilation, etc.; and the old-fashioned and imperfect modes of lighting have all been replaced by the electric light.

The accommodation for passengers has been so much improved since the establishment of steam navigation that it is probably not an exaggeration to say that an ocean voyage has been converted from a trying ordeal of uncertain duration to a mode of travelling which is both regular and luxurious. The internal arrangements of a ship have been completely revolutionised. Among the most useful and agreeable changes is the removal of the first-class cabins and saloon from the extreme after-end to the middle of the ship—a change which, with others that increase the comfort of passengers, was introduced into first-class ocean steamers by the White Star Company.

Notwithstanding what has been done in other directions, little has been effected for the benefit of passengers in reducing the rolling of ships. Even bilge keels, which are universally employed for the purpose, with unquestionable success, in H. M. Navy, are very rarely fitted to mercantile steamers; and their usefulness in diminishing the extent of a ship's rolling does not seem to be fully appreciated in the mercantile marine.

The improvements in the transport of cargo by sea have probably not been less than those connected with the carrying of passengers—though the results may not be so showy, and are of a more commercial nature. Their general effect is shown, however, in the great reduction of freights to all parts of the world which has taken place during the last fifty years. The typical cargo-carrying steamer—often spoken contemptuously of as a “tramp”—is a wonderful product of mechanical skill and efficiency. A good modern cargo steamer of 2500 tons gross register will carry a dead weight of nearly 4000 tons of coals and cargo at an average speed of nine knots, with a coal consumption of thirteen tons per day. In such a ship one ton of deadweight can be carried one mile at a speed of 9 knots, for an expenditure of half-an-ounce of coal. Cargo steamers of much larger size have recently been built in which the economy of transport is still greater.

Notwithstanding the gigantic development of steam shipping.

sailing ships still constitute a very important factor in the commerce of the world. As already stated, there were 13,500 sailing ships, with a gross tonnage of 2,944,653 tons, registered at ports in the United Kingdom at the end of 1891; and new sailing tonnage is being built for British owners at the rate of over 200,000 tons gross per annum. The cost of working a sailing ship is much less than that of a steamer, and sailing ships still retain an advantage upon some of the longest voyages as economical freight carriers. Sailing ships have been much improved during the development of steam navigation; wood has long disappeared as the material for their construction and has given place to iron and steel. Mechanical improvements have been introduced for working the sails, for loading and discharging cargo, and for reducing manual labour in all possible ways, with the result that one-half of the hands employed in a sailing ship 40 years ago, per 100 tons of measurement, are now dispensed with. The size of sailing ships has been largely increased since the commencement of ocean steam navigation; at that time there were only, as has been said, about 200 ships larger than 500 tons measurement, and there were no purely mercantile vessels that exceeded 1,000 tons; we now have sailing ships afloat up to 360 ft in length and 3,750 tons measurement, that are capable of carrying a deadweight of over 6,000 tons.

It is satisfactory to note that the loss of life at sea, which has been the subject of grave discussion and complaint, and many official inquiries during recent years, is being effectually reduced. This is the natural result of continuous improvement in the construction and equipment of all classes of ships, and doubtless, in some degree, the regulation of depth of loading now in force. The effect of such persistent effort, in many directions, by shipowners and shipbuilders, as well as by official authorities, to reduce losses at sea is shown in a paper read by Mr. Martell, the Chief Surveyor of Lloyd's Register Society, before the Institution of Naval Architects in May, 1891, whereby it appears that the percentage of loss of ships at sea during the four years 1886-89 was but little more than one-half the percentage lost during the four years 1878-81.

Space does not permit of any reference to the progress made in war-ship construction, or in other special departments of shipping. In examining the history of shipping since the commencement of

ocean steam navigation, we see continuous and rapid development in every direction, and we find nothing that would justify us in asserting or supposing that progress is likely to be less continuous or less rapid in the future than it has been in the past.

TRANSPORTATION—RAILWAYS.

BY SIR DOUGLAS GALTON, K.C.B., D.C.L., F.R.S.

There are few questions which have a greater importance than transportation has upon the progress of nations under that class of civilization which is now in progress over the world. The principal developments of machinery which have occurred since the beginning of this century have been chiefly directed (apart from those which compass the destruction of human life) towards facilitating intercourse between different countries, and between different parts of the same country; and in connection therewith the production of articles whose existence almost is due to these facilities of intercourse. There is no country in which the effects of transportation have been hitherto more evident than in the United States of America; nor is there any country upon which the facilities of intercourse in the future are likely to produce greater changes in the well-being of the people, or in the relation of classes to each other, than the British Isles. Probably in the whole history of the human race there is no instance of the growth of a great and fully-peopled empire so rapid as that of the United States of America. The growth has been due to facilities of transportation. The early development of the population took place along the great rivers and lakes, which were navigated in steamboats of a size and a mode of construction that had never been dreamed of in other parts of the world. But the United States in the character of its soil and its configuration was essentially a country which required railroads for its development. Large tracts are devoid of the material necessary to make a hard road; consequently, when the settlement extended to districts no longer accessible by river, the country began early to supplement the river navigation by railroads. Witho

these its population could never have reached its present extent, nor its civilization the condition to which it has attained.

England, which was the country in which railroads may be said to have originated, has furnished the type for European railways ; whilst the United States, which almost simultaneously commenced to construct railroads, proceeded to do so on a type of its own. Hence each country developed its railroads in its own way, and in considering the developments which have thus taken place, it is interesting to consider the characteristics by which they were respectively governed ; which again were largely influenced by the climatic conditions in the two countries. In England the railroad was made to connect existing towns ; it had to cross peopled districts full of settled interests which it would disturb ; it was looked on with suspicion and often with hostility by those conflicting interests, and was endeavoured to be utilised by persons whose property it touched, as a cow to be milked. In the United States the railroad preceded the town, and as it passed through a country devoid of settled inhabitants and was the pioneer of population, it was greeted with universal welcome ; land was freely given, and the construction was often assisted by the localities.

In England the stage coach had attained a high degree of speed, which was favoured by hard, well-made roads, but it only conveyed a limited portion of the population ; the larger part of the accommodation afforded by stage coaches was provided on the top in the open air. And whilst the stage coach was supplemented by a highly organised system of posting for the upper and richer classes, the poor had only the slow stage waggon to travel in, and at the same time the laws of settlement interfered to check the locomotion of the lower classes. In the United States the migration from the more settled eastern districts to the west was the main feature of the national development. Steamboats on the rivers were the principal means of conveyance for large numbers. The public vehicles were not numerous, they were large and cumbrous, affording covered accommodation to all, but proceeding at a very moderate speed over the unsatisfactory roads. These different characteristics at the inception of railroads have told upon the systems which have been developed in the respective countries.

In Great Britain the railroad was accepted as a luxury, and

we have required a standard of construction which has been gradually and unfortunately raised until it has undoubtedly prevented the extension of our railway system to poor and sparsely peopled districts, where cheap lines cheaply worked would have materially assisted our agricultural population in their present struggle for existence. At the same time, the character of the traffic in the respective countries materially modified the form of rolling stock. The English railroad supplies numerous centres of population placed at comparatively short distances apart. The promoters were enabled to draw upon plentiful funds, and inasmuch as the upper and middle classes alone were accustomed to travel much, the earlier vehicles were modelled on the idea of the postchaise, the stage coach, and the waggon, and the earlier accommodation was provided exactly on the lines of those methods of conveyance. Their idea was exclusiveness, and in imitating the stage waggon they relegated the poor into vehicles barely as good as a modern cattle truck, and only afforded them means to travel by rare trains at inconvenient hours. The goods traffic required to be collected and distributed at numerous points at short distances apart, for which moderate-sized vehicles were convenient.

In the United States, on the other hand, there was not then that distinction of classes. The railroad was constructed in the interests of the masses of the population, for whom a means of travel had to be provided to enable them to create fresh centres of population. The provision of money was difficult, and the lines were built on the most economical models. The Americans followed the arrangement of the steamboat saloon in the construction of the cars; they made no separation of classes, and had only one fare, the only distinction being to place the negroes in a separate car. They had to accommodate centres of population placed at great distances apart, picking up travellers from small scattered intermediate stations, whilst the great feature of the goods transportation was the conveyance of large amounts of produce from inland districts to the sea-board, which involved large trains and led to the adoption of long trucks adapted to the traffic. The English type has been followed broadly as the type of European railroads, and in judging of the two types, these earlier influences should be borne in mind.

Since the Centenary Exhibition in Philadelphia, there have

been great advances made in the European railway systems, both in respect of construction, of locomotion, and of convenience for the masses of the travelling public. The English railway companies are beginning to recognize that the third class traffic, properly developed, is most remunerative; and they are gradually affording them that necessary accommodation for long-distance travelling that has hitherto been sparingly afforded to the first-class.

In the construction of locomotives the introduction of the compound engine has been the most recent development of the locomotive on English railways.

The London and North Western Railway Company has taken the lead in introducing the compound engine. The locomotive "Queen Empress," shown by this Company, is the same in every respect as the three-cylinder compound engine "Greater Britain," which is the latest engine on this principle devised by Mr. Webb, the mechanical engineer of the London and North Western Railway.

For this engine, the average consumption of fuel when working an ordinary express train is 34·5 lbs. per mile, which includes not only the coals consumed in actually working the train, but also that used in raising steam and consumed whilst the engine is standing, reduced to the actual train miles. The experience of that Company in the working of its other engines of this type shows that thirty engines of the same type have run 9,899,214 miles to the end of December, 1892, on the fast work on various portions of the line on an average consumption of 32·4 lbs. of coal per mile under the conditions named above. The fifty larger compounds (some of which are working between London, Crewe and Carlisle, with the heavy express, mail, and postal trains) have run 12,267,887 miles on an average consumption of 37·6 lbs. of coal; this latter traffic being carried at speeds varying from forty to fifty-five miles per hour. As a contrast to this latest development of the steam-engine the Company exhibits a full-sized model of the "Rocket," with the cylinders as they were on the occasion of the trials at Rainhill, in 1829; also a full-sized model of Trevithick's tramway engine made from a tracing from an old drawing made in 1803.

The Great Western Railway Company have only lately abandoned the broad gauge. A relic of this system is their old well-

known broad gauge engine, "The Lord of the Isles," which they are exhibiting.

The introduction of electricity for promoting the safety and convenience in working as well as the comfort of passengers has made great strides.

BRITISH CARRIAGES.

BY GEORGE N. HOOPER, OF HOOPER & CO., LONDON.

Although a heavy tariff, and unusually heavy incidental expenses, may probably prevent an adequately representative display of British carriages at the Chicago World's Fair, still it will be readily conceded by competent and impartial judges that for style and quality the products of the best London carriage-builders will compare favourably with those of any other city in the world.

This remark is especially applicable to carriages of the "driving" class, such as four-horse coaches, mail phaetons, and breaks, which are diligently, persistently, and more or less accurately copied by foreign competitors; and it also applies emphatically to the two-wheeled dog-carts and pony-carts, for which English supremacy is voluntarily and openly acknowledged by continental makers.

Differing from the two-wheelers—of which it may without exaggeration be asserted that English carriage-builders have created different types by the hundred—the four-in-hand or mail coach does not permit of any radical innovation in shape or in mode of finish. Experiments, chiefly abroad, have only served to demonstrate this fact. Steady improvement has, however, been made with these carriages during the last few years, and yet without impairing their "coaching" style. They are now being built to run lighter, are hung lower, and yet more compact than formerly. The inside seats being no longer attractive, the bodies have been shortened, made narrower, and arranged more with a view to their being utilised as a store for overcoats and rugs than for the conveyance of passengers. The shutter-blinds frequently have a mirror on the inside, and lockers for mineral waters, etc., are arranged under the inside seats. Ice-

ells in the hind boot, a luncheon basket in the front boot, and a luncheon box on the roof are also found on nearly all well-appointed drags.

It is, however, not only in the production of private drags that London is supreme. During the last fifteen years road coaches for public use, owned by private gentlemen and run by them for pleasure rather than profit, have gradually but steadily been so increasing in numbers as to suggest, on certain favourite routes, a revival of the ante-railway days when coaching was at its best. During the last season no fewer than fourteen of these vehicles were running daily from London to such places as Tunbridge Wells, Brighton, Guildford, Dorking, Windsor, Hertford, and other adjacent towns. It is doubtful whether the joint efforts of any four foreign cities could produce such a muster of these vehicles as was witnessed on the Horse Guards parade when the London road coaches "met" for the first time last year.

Resembling a private coach in general outline, the road coach differs from the former in being more substantially built throughout; the hind seat being placed on wooden supports instead of on open ironwork; in the roof being arranged for the conveyance of luggage instead of for the luncheon box; in the pole-hook and bar-sockets being frequently painted black instead of being burnished; and in having the names of the towns to which it runs, and the villages through which it passes, painted conspicuously on the panels. Each coach has also its name ("Old Times," "Comet," "Perseverance") painted in some prominent position.

A professional coachman is attached to each coach, but gives up the reins to the proprietors or their friends when desired. There is also a guard, as in the old coaching days, who looks after the comfort of the passengers, puts on and takes off the "skid," takes charge of and arranges the delivery of small parcels. His chief qualification, however, would appear to lie in his ability to "blow the horn" for his own and the passengers' pleasure in the country, and to clear the way of straggling vehicles, and announce the arrival and departure of the coach when entering or leaving London or the towns and villages *en route*.

Char-à-bancs are growing in favour, and are likely to be in even greater demand as the taste for driving tours spreads. They are made in a diversity of sizes, shapes, and styles. Some are small and

light enough for a pair of cobs, others heavy enough for a team. Some are as plain and as economically constructed as it is possible to make them, others are luxuriously upholstered and handsomely finished for use with four horses and postilions, like the magnificent equipages of the Dukes of Portland and Westminster. All, when driven by the owner, possess two great advantages over the large wagonettes which they are supplanting—1st, they permit the isolation of the servants from the rest of the party; 2nd, the objectionable position of sitting side-ways is avoided, and a better view of the country is afforded. When built for a team and to carry the same number of people as a drag, they are much lighter and more compact than the latter, besides being less expensive.

The mail phaeton on perch and mail springs is still a favourite pair-horse carriage with “driving” gentlemen, whose taste is, as a rule, in favour of the older pattern and heavier build of fifty or more years ago, rather than for a reduction in weight.

Landaus have long been favourite carriages in England; they are in as much demand as ever, and will probably continue to be so. The facility with which they may be altered from an open carriage to a close one will always be an attraction in a variable climate like ours. The larger landaus are now built much smaller and lighter than formerly. During the last twelve years the exterior dimensions of a pair-horse landau have been reduced some five to six inches in length, and its width nearly in proportion, whilst thinner framework and a carefully studied and more judicious arrangement of the interior upholstery still affords comfortable accommodation for four persons.

It is noteworthy that whilst in England there have been some forty inventions, mostly patented, to facilitate the closing and opening of landau heads, and that, as a rule, all English-built landaus are fitted with one or other of these inventions, there has been but little attention given to this matter in foreign countries, where self-acting heads are the exception. Landaus are still being built in two shapes—the canoe or boat shape and the square or angular pattern. Public taste appears to be pretty equally divided between the two. The square pattern is more frequently seen in the establishments of the nobility and the wealthy, whilst the boat-shape is, as a rule, more favoured by persons of moderate means. The greater number of one-

horse landaus in London would appear to be boat-shaped. The large, pair-horse landaus on C and under springs, once so numerous, are rapidly disappearing from London parks and streets; their great weight would alone be a sufficient reason for the abandonment of this type of carriage.

It is regrettable that so graceful and imposing a carriage as the C and under spring barouche should be passing so quickly out of fashion. It has for the last half-century been unrivalled as an open carriage for ladies' use, and still surpasses all others in style and appearance. The reason assigned for its disappearance is the difficulty in obtaining, at a reasonable price, well-bred horses sufficiently large and powerful.

Its place is being taken by the sociable, which, although lacking the graceful outline and lordly appearance of the town barouche, has yet much to recommend it. It is light for the number of seats it provides, it is hung low, and is consequently easy of access with a single step. It may be, and often is, built for occasional use with one horse only; even its unimportant appearance is an advantage when quiet unofficial calls are being made, and when the barouche would be too pretentious. As a substitute for a family victoria, it possesses the important advantage of seating four persons comfortably. Apart from its merits, however, the present popularity of the modern sociable is doubtless largely due to the fact that for some years it has been and still is a favourite carriage with T.R.H. the Princess of Wales and Duchess of Fife.

Sociables without doors, or double victorias as they are generally termed, are also used in London to a certain extent; but the absence of doors, although reducing the cost of construction and saving trouble to the occupants of the carriage, leaves them more exposed to cold, dust, and mud from other passing vehicles.

Carriage fashions change slowly and gradually in England, and rarely run to extremes as they do abroad. The taste at present is, and has for some time been, in favour of curved lines and substantiality of appearance in broughams and victorias. There is in both of these carriages a decided tendency to revert to the lines of some thirty years ago; but in the brougham, as in the landau, there is a desire for reduced exterior dimensions and lightness in reality, if not in appearance. Although C-spring broughams are still retained in

large and first-rate establishments, many carriage buyers prefer the lighter elliptic spring brougham with india-rubber tyres, which by reducing vibration and ensuring comparative noiselessness have for some years now been steadily advancing in public favour. In many instances each brougham has two sets of wheels, one set with rubber tyres for town use, the other with iron tyres for use in the country, where the loose sharp stones would soon destroy the india-rubber.

Where smartness is a consideration rather than family exigencies, the single brougham is the favourite; and where a double-seated brougham is a necessity, the fashion is setting decidedly in favour of the square or flat front, instead of the bow or circular shape. In sympathy with the disposition to revert to a bygone taste for curved lines, a few double-seated broughams have been built with bent glasses to the front corners, but these are not likely to become general in London.

The fashion has for some time been decidedly in favour of curved lines for all victorias. The deep cab body with full panelled sides, or with the lower half open framework, is now, and is likely to continue, the favourite shape, for the next year or two at least. India-rubber tyres, although not so exigently called for on open carriages as on close ones, are in many cases applied to the wheels of victorias on elliptic springs. The same cab-shaped body is preferred for the C-spring victorias, and these are now built in sizes varying from that suitable to a pair of cobs to the large high victoria, almost as important in appearance as a town barouche, and driven with a pair of 16-hand horses.

Ladies' driving phaetons are still being purchased; they are generally being ordered higher and more compact than formerly, and arranged so that the ponies are harnessed closer to the driving seat; but the always limited demand for these carriages has been and still is prejudiced by the fashion for driving two-wheeled pony vehicles both in town and country.

In the production of two-wheeled dog-carts for horses and ponies it may safely be asserted that England is without a rival. These vehicles from their very simplicity would seem to be the most unpromising of all carriages for the display of variety in shape and style. English carriage-builders have not found them so, but have flooded the country with two-wheelers for all sizes of horses and ponies, in an apparently endless variety of patterns, construction

and finish. The present fashion seems to favour lines upright rather than sloping, deep panels rather than lightness of appearance, top sides of bodies curving outwards, towards, and in some cases nearly over the wheels. In nearly all, except tandem carts, the bodies are hung lower than in former years; they are also wider, and in many cases have the shafts inside. Some bodies have the hind part arranged wagonette fashion, so that the two occupants sit face to face. The styles of finish vary greatly; some carts are varnished over the natural wood, but have black wooden wings and dasher; some are painted all over, and have dasher and wings of varnished wood; others are partly painted and partly varnished. But perhaps the most popular of all low-priced two-wheelers is the "Governess Car"—a small wagonette body, without boot, hung—on elliptic springs, and with a deep cranked axle—very near the ground, and used either with a donkey or very small pony. As a rule they are finished in the natural wood, plainly varnished; and the fact that they are to be found in the coach-houses of Royalty, the nobility, and the economical country parson, proves how widespread is their popularity.

Amongst recent novelties in high-class carriages mention may be made of the "Portland" wagonette—a substantially built pair-horse vehicle with folding hood—designed by the Duke of Portland, with a special view to the comfort of a limited number of gentlemen driving to or from cover.

It is probable that the present taste for curved lines, and for substantiality rather than flimsiness of appearance, will continue for many years to come, but the demand for lightness of draught will always exist, and will doubtless become accentuated. How far this demand may be met will depend largely upon the success or failure of the alloys of steel and aluminium, which as yet have not become commercial commodities. The same metal may perhaps assist the coachbuilder of the future to prevent rust accumulating between the plates of his carriage-springs. This at present seems an insuperable difficulty. Failing this, there will probably be an extended use of steel, the price of which has, especially for wheel tyres, been so reduced as to be not higher than that charged for the best iron used for a similar purpose. These steel tyres, although harder and consequently more durable, are not so brittle as to be liable to fracture,

and are, with care, readily welded. Mild steel has long been used successfully for body plates, and for under-carriages where wood casings check the vibration which is found to seriously crystallize this metal where used separately for light stays of under-carriages. It is probable that the india-rubber tyres used so successfully at present on certain types of carriages will, at an early date, be displaced by an improved pneumatic tyre, manufactured at a moderate price, fairly impervious to puncture, and capable of easy and rapid repair. The astonishing resiliency of the pneumatic as compared with the solid rubber tyre will do much to overcome the objection sometimes raised as to the heavier draught resulting from the use of rubber instead of iron or steel tyres. The same valuable property will permit some of the carriages of the future to be built throughout very much lighter than it is now prudent to attempt.

There is at present no indication of cloth, morocco, silk and lace being abandoned for other materials, nor of any efficient substitute being found for the best paint and varnish ; but there is a demand for a spring lock that will shut securely without the door being slammed, and this want will doubtless soon be supplied.

The electric light will doubtless be ultimately adopted for carriage lamps. At present the want is a primary battery, at a moderate cost, not too bulky nor too heavy, easily re-charged by an *inexperienced* coachman, and with its contents absolutely guaranteed against leakage or spilling.

Although still suffering, in common with other home industries, from the effects of the commercial depression originated some two years ago by the financial troubles in Argentina, and also feeling severely, if indirectly, the depression of the agricultural interests in this country, English carriage-building still holds its own against all comers. It is not to be expected that, in the face of heavy tariffs, and the spread of industrial skill which invariably accompanies civilization, our export trade in ordinary vehicles is likely to be maintained. But there is, and always will be, in every civilized country a certain section of the wealthy classes whose tastes lead them to crave possession only of what is the very best of its kind, to whom quality and style are primary considerations, cost of secondary importance, and whose means permit them to gratify these desires. This is the market for which English carriage-builders

re specially fitted to cater; and so long as they, without neglecting economy of production, give their chief attention to improvement in design, style, and finish, competing with each other in quality rather than in price, so long are they likely to retain, not a monopoly, but a large share of this trade. They have everything in their favour: the accumulated experience of centuries: workmen with the inherited skill of generations: splendid and unrivalled home-grown timber in their ash, oak and elm: almost a monopoly of the importation of that special quality of mahogany which far surpasses American white wood and French walnut for panelling: the best paint, varnish, cloth, and morocco in the whole world, whilst our supremacy in coach-iron and steelwork is undisputed.

English carriage-builders will, however, see much to profit by at Chicago. As studies in the production of the maximum strength by the scientific and skilful combination of the minimum materials, the American buggies, sulkies and sleighs are unapproached, and at present unapproachable, by any English-built vehicles, and in spite of protection they are marvellously low in price. A free and full acknowledgment of the superiority of our transatlantic kinsmen, in these as in many other things, is only what is justly due to them, and will certainly not tend to affect adversely the cordiality and hospitality with which English carriage-builders have been received by their fellow-craftsmen in America.

CYCLING.

BY G. LACY HILLIER.

The cycle will always hold a prominent place amongst the many practical and valuable inventions which have been produced and perfected during the latter half of the nineteenth century—the Victorian age of the British historian. No invention, of modern times at any rate, has done more to encourage the pursuit of healthy and invigorating exercise in the open air, even at a time such as the present, when the value of bodily exercise has been so fully recognised by all who are interested in the welfare and development of the youth of the nation.

The cycle of to-day descends in a direct line from the "Draisnene," the "Célérifè," and the "Dandy Horse" of the first years of the present century. The original machine is said to have been the first-named, invented by the Baron von Drais, of Saverbrunn Mannheim on the Rhine, Master of Woods and Forests to the Grand Duke of Baden. The French claim the invention for the brother Nicephore and Claudelle Niepice, who built and used the "Célérifè" in Paris much about the same time, 1816 to 1818. These machines were cumbrous in construction, but simple in design, the two wheels running in forks which were fixed to a wooden backbone, the front pair of forks being pivoted and controlled by a cross handle, the exact form varying with the various makers' fancies. The user seated astride the padded saddle, propelled the machine by striking his feet alternately on the ground, the machine being balanced as in the cycle of to-day.

The "Dandy Horse," or "Pedestrian Curricule" as it was termed, had a brief period of popularity in England about the year 1819, and then rapidly fell into disuse, slain by the caricaturists and its own inherent defects as a practical vehicle.

For some years prior to 1840 there resided in the little village of Courthill, in the parish of Keir, Dumfriesshire, Scotland, an ingenious blacksmith of the name of Kirkpatrick Macmillan, who was in the habit of riding and, doubtless, making "Dandy Horses" and somewhat late in the thirties—the date cannot be accurately ascertained—he fitted to the rear wheel of his machine a pair of cranks, attached to them two horizontal rods, the front ends of which he hinged to two vertical bars which swung from the front part of the vehicle; and thus the first crank-driven bicycle came into existence. It appears certain that Macmillan made a number of these machines, and that the crank-driving must have come under the notice of a large number of people; but for over twenty years nothing more was heard of the "Dandy Horse" in its improved form.

It was not until late in the sixties that the velocipede once again began to come to the front. Some bicycles, ridden in Paris as children's toys, attracted the attention of an Englishman who was visiting that city, who at once saw in the machine something more than a mere plaything. Having learned to ride, he took a machine

over to London, and the "velocipede craze" was soon well under way.

The trade of the City of Coventry in sewing machines, watches, ribbons, and needles was at that time at a very low ebb, and several firms took up the velocipede and began to manufacture and improve it. Ingenious and practical minds were brought to bear upon its various details, which were steadily perfected, and Coventry became for a time the unquestioned metropolis of the cycle trade.

The votaries of the new sport had a somewhat uphill struggle in these early days, and the prejudices of the other users of the highways against the wooden horse were very marked; but in spite of the fact that the velocipedist was a very pariah of the road, the cult spread, the enthusiasm grew, and the rapidly-increasing number of bicycle users created a trade which increased by leaps and bounds—a trade which received material encouragement to make improvements in every direction. The wooden wheels of the original bicycle soon gave place to the "spider" or suspension wheel, constructed with wire spokes; but this form of wheel had been made possible by the invention of the rubber tyre. The wheel shod with rubber being protected from the disintegrating jars of the road, it is possible to make it marvellously light and delicate. The solid construction of the framework was in due course replaced by hollow tube, and the manufacture of tube suitable for this purpose is a large and flourishing industry. The plain bearings—simple boxes in which the axle of the wheel revolved—gave place to coned-bearings; these were supplanted in their turn by roller bearings; and, finally, the ball bearing was perfected: steel balls—the making of which constitutes another important branch of the trade—run in grooved and adjustable bearings and reduce the friction to a minimum. The perfection attained by this form of bearing in connection with its use in the cycle has led to its being adopted in many other machines.

Some idea of the results ultimately attained after this long period of development may be gathered from the fact that an ordinary high bicycle has been built for racing purposes with a front wheel no less than 58 inches in diameter, and ridden by a powerful athlete weighing 170 to 180 lbs., through many fierce struggles in competition, which weighed only 24 lbs.; whilst the

“Safety” racing machine of to-day weighs from 20 lbs. to 25 lbs., and is fully capable of withstanding the immense strains to which it is subjected upon the racing path.

Road machines have always been made somewhat heavier to meet the extra strain, and the experiences gained by both manufacturer and rider, in the construction and use of extremely light machines upon the path, were of the greatest service to the former in his effort to improve and perfect the “roadster” cycle.

The general excellence of the roads had, of course, much to do with the popularity of the bicycle in England, for the earlier machines needed the best roads to make their use possible; whereas with the perfected and lighter cycles of to-day, bad roads are much more easily traversed than were the best roads on the original types.

Bicycling received a considerable amount of encouragement and support from the sporting press of the United Kingdom, and prominent amateurs of the machine sent to some of the leading papers accounts of their rides, amongst such contributions being those of the late Hon. Ion G. N. Keith Falconer to the columns of *The Field*, in the years 1874-5, which attracted much attention to the nascent sport. As it grew in importance cycling created its own especial press; and in 1876 a paper devoted solely to bicycling was established, to be followed rapidly by many other publications in all parts of the world devoted wholly or in part to the interests of the sport. It is to the fact that it can support a press of its own that the new development owes much of its success; few other sports are in this position, and the rapid growth of the pastime may be attributed to this fact. The actual development of the machine was also much assisted by the great annual exhibition held in London for the last sixteen years by a well-known amateur organization known as the “Stanley Cycling Club,” which gives its name to the show. This exhibition is held at the end of each year, and attracts persons interested in cycling from all parts of the world, and has had a great part in the improvements that have been made in the cycle.

The original type of bicycle—the “Ordinary”—held its own upon both road and path for many years, its use being mainly confined to the younger and more active section of the community. The old velocipede or tricycle, however, was remodelled on modern

ines, and all the tried and tested improvements in frame-tubings, ball-bearings, spider wheels, and the like were adapted to its requirements; and those who did not dare to venture to mount the dizzy heights of the bicycle found in the resuscitated tricycle a safe, comfortable, and remarkably speedy vehicle, which was instrumental in introducing into the ranks of wheelmen a large number of persons who could not otherwise have been interested, and thus in a very large number of cases provided the stepping-stone to their becoming bicyclists when a new departure placed at their disposal a low and safe single-track mount.

The tricycle was also constructed to carry two persons—at first side by side, in the form of the clumsy but aptly named “Sociable” tricycle, and later with one rider seated behind the other in the popular, neat, and speedy “Tandem” tricycle. These machines were for the most part driven by means of a chain passing over two toothed or sprocket wheels, one fixed on the driving wheel axle and the other on the crank axle; and the power applied was distributed by means of the “balance gear,” several forms of which were popular. The experience gained in the fitting of the gear wheels and the construction and use of the chain—in both of which great improvements were soon made—led to further experiments with novel types; and a dwarf bicycle, the front wheel of which was driven by sets of pulley wheels and chains on either side, mounted on extensions of the front forks, was brought out, and for a short time was widely adopted; but it was soon ousted by the form of cycle which is to-day the most popular, and which will probably never be wholly superseded by any other type—the rear-driven safety bicycle. In this machine the wheels are of about the same size, and the front one, mounted in a pair of forks, is used for steering purposes only; the rear wheel, mounted in a triangular frame, is driven by the pulley and chain gearing from a crank-socket placed between the two wheels; and the ingenuity of the designer has been directed to securing the rigidity of this bracket and the pulley wheel it carries with regard to the pulley wheel placed upon the hub of the rear and driving wheel. By making the pulley or sprocket wheel on the crank axle larger than that upon the hub of the driving wheel, the latter is made to revolve faster than the pedal cranks. This simple plan, known as “gearing-

up," puts the user of the small-wheeled machine on an equality with the rider of the ordinary bicycle, as by its adoption the dwarf machine can be made to cover as much ground for one revolution of the pedals as does the high one.

When first introduced, the rear-driver—or "Safety," as it was colloquially termed—was crude in construction, and possessed many faults and imperfections; but practical users soon discovered them, and they were rapidly eliminated. In spite, however, of these advances, the rear-driver still lagged behind the high bicycle in point of speed upon the path, although upon the road its safety and the relatively small surface presented to the wind made it a more popular and faster mount. Again came a pause in the march of improvement; minor points were perfected, but the general plan remained unchanged until yet another new departure caused the cycle to make a fresh advance along the path of progress. This was the invention—perhaps it would be more correct to say the re-invention—of the plan of using hollow tyres containing compressed air. In 1845 a Mr. Thompson patented such a device, and in 1888 an air tyre was constructed by a veterinary surgeon in Ireland. Few, if any, inventions are perfect in their initial stages, and the earlier inflated tyres were no exceptions to this rule. The various drawbacks inseparable from the use of air under compression in an elastic bag were very apparent; not only was there the danger of puncture by some fragment of glass or other sharp object which might be encountered, but the tendency to burst had not been fully grappled with, whilst the want of a broad base, or some amount of lateral support, caused a serious amount of side-slip. All these defects in the earlier tyres have been more or less effectively remedied in one or other of the almost innumerable designs deposited in the patent offices of two hemispheres, and further improvement is still possible. The extraordinary financial success of the air tyre industry has been such as to open up a vista of "wealth beyond the dreams of avarice," to quote the Johnsonian dictum with reference to breweries; and the attention of all who are interested in the rubber trade has been drawn to this new branch of that business.

The results actually attained by the use of the air tyre have been little short of marvellous. The speed of the cycle upon the racing path has been increased probably 300 yards per mile

Besides the records recently credited to American cyclists, English amateurs have ridden nearly twenty-four miles in sixty minutes upon the "Safety" bicycle, and nearly 414 miles in twenty-four hours on the geared ordinary, these feats being performed under conditions which precluded the possibility of a doubt as to their genuineness. The average rider upon the highway has found his capacity for pace increased by one or two miles per hour, whilst his personal comfort has been materially enhanced. On the trotting track, too, the intrinsic merits of the air tyre have been clearly demonstrated.

The only type of cycle which did not appear to be materially benefited in the matter of pace by the air tyre was the original "Ordinary" bicycle. It seems probable that the limit of pedalling speed was nearly, if not quite, reached on the "Ordinary" prior to the advent of the air tyre. But another invention bids fair once again to bring the "Ordinary," or front-driving, type of cycle to the fore. By gears, of varying patterns, contained within the hub of the wheel, or attached to the fork, or crank, the front wheel, which is used both for steering and driving, is made to revolve faster than the pedals—is geared up, in fact. The geared "Ordinary," or front driver, is yet young, and awaits further improvement; but its future, as a cycle for all-round work, especially over rough roads and during the winter months, is already thoroughly well assured.

The value of the sport of cycling to the community at large is very great, even if it be regarded only from the recreative point of view. By means of the cycle the city-pent toiler can reach in a brief space of time the open country; youth can secure healthy and invigorating exercise; age can find pleasure and excitement in a trip a-wheel; nor is the softer sex debarred from a sport in which, now that the cycle has been so materially lightened, skill produces better results than mere strength, and the woman of the nineteenth century mounts and rides the "Safety" bicycle with ease, grace, and comfort.

The value of the sport does not end with its recreative character: it has its economic side. Thousands of persons in the United Kingdom use it as a business vehicle, which affords them a means of convenient and rapid transit from place to place. The "Carrier" cycle has been widely adopted in London and other cities, not only by the newspaper press, but also by tradesmen whose wares

need to be rapidly delivered; in short, from whatever point of view it may be regarded, whether as an enjoyable recreation and practical means of travelling, or as supporting a gigantic and growing industry, the sport of cycling presents important and valuable claims to attract the attention of the thoughtful observer.

DEPARTMENT G.

TRANSPORTATION—RAILWAYS, VESSELS, VEHICLES.

The Exhibits in this Department are in the Transportation Building, on the Ground Floor unless otherwise stated, or in its Annex.

GROUP LXXX.

RAILWAYS, RAILWAY PLANT AND EQUIPMENT.

- 196 Aldridge, James George Willcox,** *Westminster Chambers, 9 Victoria Street, London, S.W.* [Annex.]

Combination sleeping berth for railway cars; combination sleeping berth for ships' cabins.

- 197 Baker, Sir Benjamin, K.C.M.G.,** *2 Queen Square Place, Queen Anne's Mansions, Westminster, London, S.W.*

Model of the Forth bridge.

- 198 Belfast & Northern Counties Railway,** *Belfast.* [Annex.]

Photographs of views of Giant's Causeway, Antrim coast, glens of Antrim, and North of Ireland.

- 199 De Monte & Jost (Eduardo Miquel de Monte and Carl Jost),** *13-15 Hornby Row, Bombay, India.* [Annex.]

Model of a length of railway, fitted with an invention for automatically controlling the entry and exit of trains to and from each section of the line, so that each of such sections can only be occupied by one train at a time, and the possibility of a collision absolutely prevented.

- 200 Dorn, Charles Frederick,** *Blythe Hill, Catford, London, S.E.*

Model of a car for the transport of live stock, capable also of being transformed into a goods wagon.

- 201 Fowler, Sir John, Bart., K.C.M.G.,** *2 Queen Square Place, Queen Anne's Mansions, Westminster, London, S.W.*

Model of the Forth bridge.

- 202 Great Eastern Railway Co., Liverpool Street Station, London, E.C.** [Annex.]

Map of their railway system generally, showing the new Cathedral route between Liverpool and London, and the Harwich route to the Continent, *via* Antwerp, Rotterdam, and Hamburg, with photographs of the cathedrals and places of interest on their lines.

- 203 Great Western Railway Co., Paddington Station, London, W.** [Annex.] [See Advt.]

Broad-gauge engine, "Lord of the Isles," standing on bridge rails held by fang bolts to longitudinal timbers 14 in. by 7 in., framed with transoms and ties; specimen of modern permanent way bull-head steel rails laid in cast-iron chairs upon cross sleepers 10 in. by 5 in., about 2 ft. 8 in. apart; specimens illustrating vacuum brake machinery in use on system; photographs of district served by railway.

- 204 Irish Railway Companies, 5 Kildare Street, Dublin.** (*Collective exhibit of the Cork, Bandon and South Coast, Great Northern, Great Southern and Western, and Midland and Great Western Railway Companies.*) [Annex.]

Photographic views of Irish scenery.

- 205 London & North Western Railway Co., Euston Station, London, N.W.** [Annex.] [See Advt.]

Compound express passenger locomotive (F. W. Webb's system), 42-ft. sleeping saloon, 42-ft. composite carriage; working model of "Dreadnought," full-size model of "Rocket," Trevithick's high-pressure engine, 1803-9; key interlocking, standard interlocking apparatus (F. W. Webb's system); electrical staff and ticket apparatus (Webb and Thompson's) for controlling traffic on single-line railways; electrical boiler tube cutter; model of gridiron sorting sidings, Edgehill (H. Footner's system); photographs illustrating engines, rolling-stock, and scenery on the system.

- 206 Midland Railway Co., Derby.** [Annex.] [See Advt.]

Photographs of passenger engines, carriages, and appliances, and places of interest on or reached by the Midland route.

- 207 Purdon, William, 5 Lambert Street, Hull.** [Annex.]

Working model of railway carriage door fitted with automatic window.

- 208 Westwood & Winby, 11 & 12 Clement's Lane, London, E.C.**
[Annex.] [See Advt.]

Express passenger locomotive engine of the bogie class, built for a 4 ft. 8½ in. gauge, with 4 high pressure cylinders arranged for driving two pairs of 7 ft. 6 in. wheels without coupling rods, and boiler and fire box having 2000 sq. ft. of heating, and 28 ft. of grate surface; Westwood and Rigby expansion gear for bridges; F. C. Winby's patent rail joint or chair.

See boilers, engine parts and appliances, GROUP LXIX.

See also signals, GROUP CXXXIII.

Brown Brothers. See GROUP CLI.

Low Moor Company, Limited. See GROUP XLIX.

Macfarlane, Strang & Co., Limited. See GROUP LXIX.

GROUP LXXXI.

STREET CAR AND OTHER SHORT LINE SYSTEMS.

- 209 Cradock & Co., George, Wire Rope Works, Wakefield.**
[See Advt.]

Samples of new and worn cable tramway and mining ropes made on Lang's patent lay.

- 210 Smith, Thomas & William, St. Lawrence Ropery, Newcastle-on-Tyne.**

Steel wire cables for use on cable tramways.

Ward Electric Car Co., Limited. See GROUP LXXXIII.

GROUP LXXXII.

MISCELLANEOUS SPECIAL RAILWAYS.

See mining, GROUP LXIII.

GROUP LXXXIII.

VEHICLES AND METHODS OF TRANSPORTATION ON COMMON ROADS.

- 211 Brigg, T. H., Thornton Road, Bradford; and 52 Queen Victoria Street, London, E.C.** [Annex.] [See Advt.]

System of draught and haulage of 4-wheeled vehicles, universal wheelplate for fore carriages of all 4-wheeled vehicles, minimising the strains, draught, and the tilting tendency of carriages, vehicles with both these patents attached, patent machine to facilitate the carrying of loads by a man either walking or running, patent humane bearing-rein.

- 212 Briggs, Thomas, Bridge Street Patent Cart Works, Darwen, and Old King's Head Hotel, Salford, Manchester.**

Adjustable 2-wheeled tipping general purpose cart, fitted with noiseless automatic brake on both wheels, which absolutely relieves animal when travelling either up or down hill with heavy loads; also applicable to spring carts.

- 213 Carver, Joseph, Walsall.**

Coaching, racing, hunting and other whips, bridles (for riding) in leather and white whipcord, pillar reins, stirrup leathers.

- 214 Cope and Sons, Limited, Benjamin, Bloxwich, near Walsall.**
[See Advt.]

Bridle bits for riding, driving, trotting, coaching, racing, polo, exercising, breaking, military and other purposes; chains, curb, leading pole, burnishing, spring hooks, stirrup irons, park, riding, hunting, steeplechasing, Newmarket racing; B. Cope's patent safety stirrups; mounted bridles for riding, hunting, racing, polo, picketing, breaking, stallions, breastplates, martingales, girths, stirrup leathers, head collars, harness fronts, rosettes, whip sockets, rein holders.

- 216 Davis and Wilson, 37, 37½, and 38 Sun Street, West Birmingham.**

Whips, whalebone rosettes, whip ornaments, and materials.

- 217 Disc Wheel Co., Limited (The), 60 Defoe Road, Tooting, Surrey.**

A spokeless wheel for cycles and other vehicles.

- 218 Guest and Barrow, Tower Works, Birmingham. [Entresol.]**

Safety bicycles.

- 219 Hitching and Wynn, 19, 21 & 23 Ludgate Hill, E.C.; 116 & 204 Oxford Street, W., London; 74 Bold Street, Liverpool; 19 St. Stephen's Green, Dublin.**

Baby, doll, and goat carriages, children's mail carts and tricycles, combination carriage chairs.

220 Horsley and Sons, Charles, *Beccles, Suffolk.*

Victoria, hung on cee springs behind and elliptic front springs, fitted with pole, bar, shafts and lamps ; brougham, single seated, hung on cee under springs, with steel perch and leather braces, body built with steel plates, for one or two horses ; landau, canoe shaped, small, medium size, built with steel plates, fitted for one or two horses.

221 Humber & Co., Limited, 32 *Holborn Viaduct, London, E.C.*

[Entresol.]

Cycles, roadster safety bicycle, road racer, and racer with pneumatic tyres, racer with pneumatic tyres made specially light for use on good tracks.

**222 Institute of British Carriage Manufacturers (Incorp. 1883),
*Secretary's Offices: Copthall House, Copthall Avenue, London, E.C. Including loan exhibits from Atkinson and Philipson, Newcastle-on-Tyne; Andrew W. Barr, Copthall Avenue, London; and S. & A. Fuller, Bath.***

[Entresol.]

A collection of models, paintings, drawings and engravings, sketches of all types of coaches, chariots, and other vehicles and parts of same, in use at different periods, illustrating the progress of invention and improvement in carriage building ; specimens of heraldry paintings ; engravings, lithographs of Indian and other modes of transport ; caricatures of English and Irish methods of travelling.

223 Laurie and Marner, 311 *Oxford Street, London, W.*

Dress coach used by the Lord Mayors of London.

224 Martin and Martin, 103 *Gloucester Road, South Kensington, London, S.W.*

[See Advt.]

Harness, saddlery, riding canes, whips ; box cloth driving and coaching aprons, lap robes ; gladstone and fitted bags, purses, pocket-books ; leggings, garters, and driving gloves.

225 Metallic Tube & Flask Co., Limited (The), *Wiggin Street, Birmingham.*

[Entresol.]

Patent weldless cold drawn steel tubes ; cycle spokes.

- 226 Morgan and Co., Limited, Long Acre, W.C., and 10 Old Bond Street, W., London.** [See Advt.]

Four-in-hand drag, complete; mail phaëton, complete; square-fronted brougham, and canoe Victoria with patent head (both with cee and under springs); medium size landau with patent head and steps, skeleton body canoe Victoria with patent head, rustic cart and "Moroi" car (all with patent cee springs).

- 227 New Howe Machine Co., Limited (The), Bridgeton, Glasgow.** [Entresol.]

Bicycles and tricycles, and cycle parts.

- 228 Peat & Co., Henry, 173 Piccadilly, London, W.**

Harness, saddlery, and horse clothing; horse blankets; stable fittings; dog collars.

- 229 Premier Cycle Company, Limited (Hillman, Herbert and Cooper, Limited) (The), Premier Works, Coventry.** [Entresol.]

Bicycles and tricycles, and cycle parts.

- 230 Quadrant Cycle Co. (The), Birmingham; Chicago Office and Sale Room, 297 Wabash Avenue.** [Entresol.]

"Quadrant" safety bicycles.

- 231 Raleigh Cycle Co., Limited (The), Russell Street, Nottingham; New York: dépôt, 1790 Broadway; factory, corner of Bank and Greenurch Street.** [Entresol.]

Bicycles and tricycles, with air and other tyres, and cycle parts,

- 232 Seddon's Patent Pneumatic Tyre Co., Limited, Manchester, Birmingham, London, Coventry, and Dublin.** [Entresol.]

Seddon's pneumatic tyres, bicycles, tricycles and cycle accessories.

- 233 Sparkbrook Manufacturing Co., Limited (The), Paynes Lane, Coventry.** [Entresol.] [See Advt.]

Bicycles and tricycles and cycle parts.

- 234 St. John Ambulance Association (The), St. John's Gate, Clerkenwell, London, E.C.**

Ashford litter and stretcher and ambulance material.

235 Swaine & Adeney, 185 *Piccadilly, London, W.*

Whips for driving single horse, pair-horse, tandem and four-horse, riding whips for ladies and gentlemen, hunting and stock whips, thongs of every description; hunting and coach horns; walking sticks and canes; horse measurers; hunting flasks and sandwich cases.

236 Ward Electrical Car Co., Limited, 75 *Victoria Street, Westminster, London, S.W.* [Annex.]

Electric vehicles.

237 Warman & Hazlewood, Limited, *Coventry.* [Entresol.]
[See Advt.]

Safety, and geared ordinary bicycles, bicycle parts, fittings and accessories, including the "never fail" continuous rim brake for cycles.

238 Whitworth Cycle Co., (The), *Whitworth Works, Rea Street South, Birmingham.* [Entresol.]
"Whitworth" cycles.

239 Wilson, Henry, 147 & 148 *Townsend Street, Dublin.* [Ground Floor.]
Set of dray harness, set of heavy van harness.

240 Woods & Son, *St. Ives, Huntingdonshire.*
Registered "Ivo car."

241 Zimer, F. W., 99 *Mortimer Road, London, N.* [Entresol.]
Patent "Zimer" power mechanism for assisting the propulsion of front-steering cycles by actively utilising the strength of the arm muscles, adapted for those desiring greater power or able to exert little or no power with their legs.

Cook & Son, Thomas. See GROUP LXXXV.

GROUP LXXXIV.

AERIAL, PNEUMATIC, AND OTHER FORMS OF TRANSPORTATION.

Lorrain, James. See GROUP CXXVIII.

GROUP LXXXV.

VESSELS, BOATS—MARINE, LAKE, AND RIVER TRANSPORTATION.

- 242 Atlantic Transport Line (The)**, 108 *Fenchurch Street, London, E.C.*; 4 *Broadway, New York*; 403 *Water Street, Baltimore*; 236 *La Salle Street, Chicago*; 307½ *Pine Street, St. Louis*.

Models of twin-screw steamers "Massachusetts," "Manitoba," "Mohawk," and "Mobile," furnished with all appliances for carriage of passengers, live stock, dead meat, and cargo of all descriptions.

- 243 Belfast Ropework Co., Limited (The)**, *Belfast*.

Ropes for ships' use (plain and hawser laid, tarred and untarred), for transmission of power, for fishing purposes; plaited sash and blind cords, cords for packing and other purposes; plaited log lines, clothes, fishing, and masons' lines; reaper and binder twine, seaming, roping, and netting twines, twines for shop and other purposes.

- 244 Bryer & Son, J.**, 104 *Minories, London, E.C.*

Binnacle and compasses for steam yachts (iron and composite, new type), ships' lamps, deck lights, sextants, binocular glasses, barometers, chronometers.

- 245 Cleghorn, Junr., William**, *Albert Mill and Clepington Works, Dundee, Scotland*. [See Advt.]

Pure hemp oakum (spun in balls ready for use, and teased for hand spinning), sheathing felt.

- 246 Cook & Son, Thomas**, *Ludgate Circus, London, E.C.*

Objects and models illustrative of their system of transport and travel in various countries and different periods.

- 247 Cunard Steam Ship Co., Limited**, 8 *Water Street, Liverpool*.

Models (scale $\frac{1}{4}$ inch to 1 foot) of Royal Mail steamships "Britannia" (1840) 1,139 tons, 740 I.H.P., "Hibernia" (1843) 1,139 tons, 1,040 I.H.P., "Asia" (1850) 2,226 tons, 2,400 I.H.P., "Persia" (1855) 3,300 tons, 4,000 I.H.P., "Scotia" (1862) 3,871 tons, 4,900 I.H.P., "Russia" (1867) 2,959 tons, 3,100 I.H.P., "Gallia" (1879) 4,808 tons, 5,300 I.H.P., "Umbria" (1884) 8,127 tons, 14,500 I.H.P., "Campania" (1893) about 12,500 tons, about 24,000 I.H.P.

- 248 Currie & Co., Donald** (*Managers of the Castle Mail Packet Co., Limited*), London, Glasgow, Liverpool, Manchester, Cape Town, Algoa Bay, East London, and Natal.

Models of Castle Line Royal Mail steamships engaged in the Royal Mail service between England and South Africa, maps and photographs.

- 249 D'Arcy Irvine, John, Commander (Ret.)**, Harbour House, Howth, co. Dublin.

Shoulder line-throwing gun, with automatic life-buoy.

- 250 Denny & Brothers, Wm.**, Leven Shipyard, Dumbarton, Scotland.
[See Advt.]

The following full models: steel screw steamship "Jumna," and steel twin screw cattle and passenger steamer; steel paddle-ships "Duchess of Hamilton," "Woolwich Belle," "Princess Victoria," "Leopold II.," "Thoreah," iron paddle steamship "Loch Lomond;" half models: steel screw steamships "Lindula," "Monowai," "Megna," "Rotomahana," "Taviuni," "Rotokino," "Aramac," steel paddle steamship "Venus;" sectional model of steel screw steamer "Telunga."

- 251 Fairfield Shipbuilding & Engineering Co., Limited (The)**, Fairfield Works, Govan, Glasgow; and 113 Cannon Street, London, E.C.
[See Advt.]

Ships' models, photographs of ships and engines.

- 252 Furness, Withy & Co., Limited**, West Hartlepool.

Model of cargo steamer, 400 ft. by 48 ft. by 30 ft.; to carry 6,500 tons dead weight on 23 ft. 4 in. mean draught; built of steel on web frame system; cellular double bottom; engines 32 in., 49 in., and 77 in. by 48 in. stroke; two boilers 15 ft. diameter by 17 ft. long.

- 253 Green, Joseph F.**, Blackwall Yard, London, E.

Model (1 inch scale) of patent hydraulic lifeboat.

- 254 Hawthorn, Leslie, & Co., Limited, R. & W.**, Newcastle-on-Tyne.

Models of steel twin screw passenger and emigrant steamers "Saratou" and "Orel," built for the Russian Volunteer Fleet Association; of steel twin screw passenger and cargo steamers "Santos," "Desterro," "Porto Allegre," built for Brazil for coasting service; of steel screw passenger and refrigerated meat vessel built for trade on the Coast of Brazil and Amazon river.

255 Heslop & Co., Limited, Seamless Steel Boat Works, Wakefield.
Pressed seamless steel boat.

256 Holmes, Joseph R., 13 York Chambers, York Buildings, Adelphi, London, W.C.

Torpedo indicating flash light, for use during practice to show direction and course taken under water; inextinguishable life-saving lights and distress flares; mortar projectiles.

257 Horne, W. C., 2 White Horse Alley, White Horse Engineering Works, Cow Cross Street, London, E.C.

Luminous life buoy, luminous mooring buoy, luminous compass, luminous charts, luminous tallies, luminous tape.

258 Laird Bros., Birkenhead.

Models: "John Randolph" (1834), H.E.I.C. "Euphrates" (1834), H.E.I.C. "Nemesis" (1839), Ferry Steamer "Nun" (1840), H.M.S. "Dover" (1840), "St. Colombo" (1847), "Ulster" (1860), "Ireland" (1885), "Robert F. Stockton" (1838), "Fore-runner" (1852), "Nubia" (1854), "Ibex" (1891), "Cambroman" (1892), "Countess of Ellesmere" (1852), "Kildare" (1867), "Morna" (1877), "Imperador" (1854), "Dayspring" (1857), "Westernland" (1883), Screw-steam Frigate (1836), H.M.S. "Royal Oak" (1893), "Almirante Lynch" (1890), "Huascar" (1865), "Esparança" (1887), "Cranborne" (1866), Stern Wheel Steamer (1887), "Cestria" (1887), "Lidador" (1884), "Rattlesnake," 524 tons (1886), "Agincourt" (1865), "Clive" (1882), "Santa Rosa" (1872), "Espora" (1891), Yacht for Mr. Vanderbilt (1893).

259 Langley, George, 34 Leadenhall Street, London, E.C.

Models of patent improved original pattern "Martin anchors;" specimen working anchor, weighing 70 cwt., for ironclad of 7,000 tons, tested 100 per cent. above Admiralty proof, with breaking strain of 200 over.

260 Mills, William, Bonner's Field, Sunderland.

Instantaneous patent engaging and disengaging gear for boats and launches; model of navy cutter fitted with this gear.

- 261 Musselburgh Wire and Steel Works** (proprietor, Wm. N. Brunton), *Musselburgh, Scotland.* [See Advt.

Roping, bridge and cable wire (steel), galvanised hawser wire, music, and gun wire.

- 262 Peninsular and Oriental Steam Navigation Co., Limited** (The), *122 Leadenhall Street, London, E.C.*

A map, with models on it, showing the various parts of the world served by the Company's steamers; various statements illustrating the progress of naval architecture and marine engineering since the founding of the Company in 1837; collection of small models arranged so as to show the various types of mail steamers during periods of ten years; the whole representing the Company's vessels from 1837 to the present time.

- 263 Simons & Co., William,** *London Works, Renfrew, Scotland.* [See Advt.

Models of marine dredgers and elevating deck ferry steamer.

- 264 Suter, Hartmann & Rahtjen's Composition Co., Limited,** *18 Billiter Street, London, E.C. Agents in New York, Rahtjen's American Co., 26 Beaver Street.*

Anti-fouling and anti-corrosive paints for protection of iron and steel vessels and other metal structures.

- 265 Thames Ironworks and Shipbuilding Co., Limited,** *Orchard Yard, Blackwall, London, E.*

Following models: H.M.S. "Warrior," "Benbow," "Sanspareil," "Blenheim," "Grafton," "Theseus," "Superb," "Waterwitch," "Minotaur," "Serapis," "Swift," "Linnet;" German armour-clad "Konig Wilhelm," torpedo cruiser, "Zieten;" Turkish armour-clads "Mesovdye," "Avni Illah;" Portuguese war vessels "Vasco di Gama," "Alfonso de Albuquerque;" Spanish frigate "Victoria," cruisers "Gravina," "Velasco;" Russian paddle sloop "Vladimir," and armour-clad "Pervenetz;" Greek armour-clad "King George;" Danish gunboats "Absalom," "Esberne Snare;" "Mosquito" sailing yacht, screw yacht "Fairy," for H.M. the Queen, twin screw yacht for H.M. the Sultan; Brazilian troopship "Purus;" tug, mail, and other special service boats, U.S. competitive designs for armoured cruiser and armoured battleship.

266 Thomson, Limited, James & George, Clydebank, Scotland.

The following models: H.M.S. first class battleship "Ramillies," second class cruisers "Terpsichore," "Thetis," "Tribune," and torpedo cruiser "Scout;" Royal Spanish first class cruiser "Reina Regente," and torpedo catcher "Destructor;" screw steamer "America;" twin screw channel steamers "Frederica," "Lydia," and "Stella;" passenger paddle steamers "Columbia" and "Glen Satnon;" twenty-three knot Atlantic passenger steamer.

267 Turk, R. J., Kingston-on-Thames.

Model (12 by 2 ft.) of Thames skiff, fitted with new rail and gratings, two pairs of sculls, boat-hook, mast and sail, and cushions, carpet, and rudder-lines to match.

268 Union Steamship Co., Limited, South African House, 94 to 96 Bishopsgate Street Within, London, E.C.

Full models of twin screw Royal mail steamer "Scot" (rigged), 6,850 tons, 12,000 H.P., and Royal mail steamer "Mexican," 4,549 tons, 4,600 H.P.

269 Weeks, & Son, J. W., 276 Westminster Road, Liverpool, N.

Composition for steamers' funnels and other heated surfaces, funnels painted with same, showing colours adopted by the various companies.

270 White Star Line (The) (Ismay, Imrie & Co.), 10 Water Street, Liverpool. (Special building in grounds.)

Kiosk containing models of steam and sailing ships, specimen state rooms.

271 Wimshurst, James, 4 The Grove, Clapham Common, London.

Model of the first freight carrying steamer.

See boilers, pumps, condensers, and appurtenances, GROUP LXIX.

See fishing boats and vessels, GROUP XXXVIII.

See nautical instruments, GROUP CLI.

Aldridge, J. G. W. See GROUP LXXX.

Brown & Co., Limited, John. See GROUP LXXXVI.

Combe, Barbour & Combe, Limited. See GROUP IX.

Johnson & Co., S. H. See GROUP LXIX.

Pain & Sons, James. See GROUP LXXXVII.

Ross & Duncan. See GROUP LXIX.

Smith & Sons. John. See GROUP XCIX.

GROUP LXXXVI.

NAVAL WARFARE AND COAST DEFENCE.

- 272 Adamson Gun Syndicate, Limited (The),** 36 *Coleman Street, London, E.C.*

Patent Adamson quick firing gun designed by the late Daniel Adamson :—bore, $3\frac{5}{16}$ inches; weight, 11 cwt. 22 lbs.; length, 8 feet $4\frac{2}{3}$ inches; rapidity of shooting, 5 shots in 20 seconds; length of shootings, 26,250 feet, or nearly 5 miles, at elevation of 25 degrees.

- 273 Armstrong, Mitchell & Co., Limited, Sir W. G.,** *Elswick Works, Newcastle-on-Tyne.*

Half model, $\frac{1}{12}$ th full size, of H.M.S. "Victoria":—length, 360-ft.; breadth, 70-ft.; mean draught, 26-ft. 9-in.; displacement, 10,510 tons; I.H.P. forced draught, 14,244; speed, $17\frac{1}{2}$ knots; armour belt and redoubt armour, 18-in.; armour bulkheads, 16-in.; turret armour, 17-in.; conning tower, 14-in.; protective decks, 3-in.; screen bulkheads, 5-in.; armament, 2 110-ton, $16\frac{1}{4}$ -in. in turrets, 1 10-in. on deck aft, 12 6-in. in upper deck battery, 12 6-pounder on spar deck, 9 3-pounder, 6 Nordenfelt, 4 14-in. torpedo tubes above water, and 4 ditto below.

Full model, $\frac{1}{48}$ full size, of Argentine cruiser, "25 de Mayo": length, 351-ft.; breadth, 43-ft.; mean draught, 16-ft.; displacement, 3180 tons; I.H.P. forced draught, 14,052; speed, $22\frac{1}{2}$ knots forced draught, $21\frac{1}{4}$ natural; protective deck on slopes, $4\frac{1}{2}$ -in. and $3\frac{1}{2}$ -in.; horizontal parts, $1\frac{3}{4}$ -in.; conning tower, 4-in.; glacis plates, 5-in.; armament, 2 8-in., one forward, one aft, 8 4.7-in. Q.F., 12 3-pounder, 12 1-pounder, and 3 18-in. torpedo tubes.

- 274 Brown & Co., Limited, John,** *Atlas Steel and Iron Works Sheffield.*

Compound armour plate (Ellis' patent), steel armour plates, armour plate bolts, sleeves, nuts; marine boiler front flanged, ribbed furnace flues (Purves' patent), winged boiler tubes (Serve's patent), marine shafting.

- 275 Maxim Nordenfelt Guns and Ammunition Co., Limited (The),** 32 *Victoria Street, London, S.W.*

Automatic and semi-automatic quick-firing and machine guns, with their mountings, accessories and ammunition.

276 Yarrow & Co., Poplar, London.

Models of torpedo-boat catchers, speed 27 knots, loaded ; first class torpedo-boats, speed 23 knots, loaded ; and second class torpedo boats, speed 18 knots, loaded, for the British Government ; model of the "Opale," built for the French Government for service in Dahomey on Yarrow's system of floatable sections, by which means the vessel was shipped in sections and united afloat in a few days ; draft, 18 inches ; speed, 10 miles.

See also exhibits in GROUP LXXXV.

See materials of war, GROUP CXIII.

STAND No. 250.

William Denny & Brothers,

DUMBARTON, SCOTLAND,

SHIPBUILDERS.

SPECIALITIES in High Speed Vessels for River or Ocean Work.

BUILDERS OF TWIN SCREW STEAMER "SCOT."

(See Model, Stand No. 250.)

HOLDER OF THE RECORD TO AND FROM THE CAPE.

Also the Paddle Steamers "LEOPOLD II.," "PRINCESS HENRIETTE,"
and "PRINCESSE JOSEPHINE."

The Fastest Paddle Vessels in the World.

"PRINCESS MAY," "PRINCESS VICTORIA," "DUCHESS OF
HAMILTON," etc., etc. (See Models in Stand.)

Light Draught Work for Eastern Rivers, WILLIAM DENNY AND
BROTHERS have constructed almost the entire fleets of the Irawaddy Flotilla
Company, Ltd., Rangoon, and the Rivers Steam Navigation Company,
Calcutta.

he renowned Experimental Tank, which has contributed so materially
to the success of WILLIAM DENNY AND BROTHERS, is situated in their yard
at Dumbarton, and is the only one in the world belonging to a private firm.

FIRMS IN CONNECTION WITH WILLIAM DENNY AND BROTHERS.

enny & Co., Engineers and Boilermakers, Dumbarton, Makers of
Brock's patent quadruple engine, and Brock and Weir's patent economical
high and low power engine; also of Pope's patent flanges, and Peter
Denny, Jun.'s steam pipe protection.

ennystown Forge Company supply forgings to H. B. Majesty's Navy
Department, and to all the leading Shipbuilders and Engineers. Makers of
hollow shafting by patent machinery.

ardie and Gordon, Founders, makers of brass, iron, and steel castings.

umbarton Rope Works Company, Makers of Cordage and Wire Ropes.

By Royal Appointment.



T. C. BROWN-WESTHEAD, MOORE & CO.,

Potters to Her Majesty,

CAULDON PLACE,

STOKE-ON-TRENT,

MAKERS OF THE CELEBRATED

“CAULDON WARE”

IN

Porcelain and Earthenware.

See the Exhibit in the British Section of the
Manufactures Building.

No. 344 Columbia Avenue.

Department II.

MANUFACTURES.

STATISTICS OF BRITISH AND IRISH EXPORTS OF MANUFACTURES.

BY REGINALD H. HOOKER, B.A.

Assistant Secretary to the Royal Statistical Society.

The foreign and colonial trade of the United Kingdom consists to a very great extent in the importation of food stuffs and raw materials, and in the re-exportation of these latter after they have undergone various manufacturing processes. The imports of "manufactured articles" are comparatively insignificant, amounting in 1892 only about 15 per cent. of our total imports; while "manufactured and partly manufactured" goods form no less than 86 per cent. of the exports of British and Irish produce and manufacture. A comparison of these two proportions is, however, untrustworthy, as the two groups by no means comprise the same articles; the most important difference being that *metals*, whether wrought or not, are included in the case of exports, but when unwrought are grouped separately in the case of imports. The total value of metals (unwrought) imported in 1882 was about £18,500,000, and in 1892, £21,094,000. If these be added to the imports of manufactures we have a sum in 1892 of £86,535,000, or about 20 per cent. of our total imports, whereas 86 per cent. of our exports are made up of similar wares. Even with this correction, however, such comparisons are misleading, as there are other articles—notably many chemicals—which, classed with manufactures in one case, are not so in the other.

Prior to 1884, the various articles enumerated in the Board of Trade returns were not grouped; but since that year the imports have been classified (in the monthly trade returns only) under nine heads, and the exports under four. A consideration of the appended tables shows that, while the value of the "manufactures imported" has increased between 1882 and 1892 by nearly £13,000,000, or almost 25 per cent., that of the exports of "manufactured and

MANUFACTURED AND PARTLY MANUFACTURED ARTICLES (BRITISH AND IRISH ONLY) EXPORTED FROM THE UNITED KINGDOM.

[ooo omitted.]

	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892
Yarn—Cotton	£ 12,865,	£ 13,510,	£ 13,813,	£ 11,865,	£ 11,487,	£ 11,379,	£ 11,657,	£ 11,712,	£ 12,341,	£ 11,177,	£ 9,696,
" Woollen	3,399,	3,266,	3,890,	4,383,	4,411,	3,970,	4,052,	4,342,	4,086,	3,911,	4,057,
" All other	3,073,	2,986,	3,256,	2,833,	3,030,	2,688,	2,512,	2,948,	2,905,	2,893,	2,726,
Manufactures—Cotton	62,931,	62,936,	58,935,	55,112,	57,367,	59,580,	60,329,	58,793,	62,089,	60,230,	56,270,
" Woollen & Worsted	18,769,	18,316,	20,137,	18,847,	19,738,	20,595,	19,993,	21,325,	20,418,	18,447,	17,903,
" All other	* 11,000,	10,384,	9,833,	8,839,	9,318,	9,862,	10,327,	11,052,	10,608,	9,338,	9,414,
Total, Textiles	* 112,000,	111,398,	109,864,	101,879,	105,351,	108,074,	108,870,	110,172,	112,447,	105,996,	100,066,
Metals—Copper and Brass	3,778,	4,001,	4,020,	3,469,	2,898,	3,002,	3,391,	3,773,	5,053,	4,345,	4,228,
" Iron and Steel	35,705,	32,346,	27,639,	24,563,	24,664,	27,913,	29,585,	32,131,	34,329,	29,405,	23,970,
" Machinery	11,932,	13,433,	13,073,	11,087,	10,137,	11,125,	12,939,	15,274,	16,411,	15,818,	14,799,
" All other	* 3,950,	4,199,	5,520,	3,678,	4,157,	4,017,	4,180,	5,010,	5,840,	5,460,	4,869,
Total, Metals	* 55,500,	53,979,	50,252,	42,797,	41,856,	46,057,	50,095,	56,188,	61,633,	55,028,	47,856,
Apparel, &c.	* 12,750,	11,330,	10,788,	10,340,	9,761,	10,245,	11,195,	11,416,	11,286,	11,331,	10,419,
Chemicals, &c.	7,651,	7,790,	7,839,	6,978,	6,696,	7,038,	7,436,	7,933,	8,966,	8,878,	8,588,
All other articles	* 30,000,	30,533,	29,690,	27,197,	26,377,	27,111,	30,989,	33,071,	34,535,	32,204,	28,677,
Total British & Irish Manfcts.	* 218,000,	215,030,	208,433,	189,191,	190,041,	198,525,	208,584,	218,780,	228,867,	213,437,	195,606,
Total Exports, British and Irish Produce & Manfctre.	241,467,	237,792,	233,025,	213,115,	212,725,	221,913,	234,534,	248,935,	263,531,	247,235,	227,060,
Total Exports (including)	306,661,	305,437,	295,968,	271,474,	268,959,	281,263,	298,578,	315,593,	328,952,	309,114,	291,461,

[ooo omitted.]

	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892
Cotton Goods . . .	£ 2,416,	£ 2,340,	£ 2,240,	£ 1,979,	£ 1,859,	£ 2,281,	£ 2,251,	£ 2,471,	£ 2,356,	£ 2,699,	£ 2,812,
Glass . . .	1,679,	1,606,	1,616,	1,632,	1,545,	1,674,	1,907,	1,782,	2,085,	2,300,	2,434,
Iron and Steel . . .	2,475,	2,871,	2,693,	2,361,	2,200,	2,357,	2,699,	3,009,	3,194,	3,275,	3,035,
Leather . . .	5,273,	5,466,	5,418,	5,769,	5,536,	5,619,	5,910,	6,674,	6,376,	6,633,	6,398,
„ Gloves . . .	1,928,	1,939,	1,673,	1,503,	1,527,	1,629,	1,599,	1,706,	1,750,	1,916,	1,970,
Paper (except Hangings) . . .	1,203,	1,246,	1,403,	1,364,	1,487,	1,573,	1,770,	1,858,	1,918,	2,124,	2,373,
Silk, Broadstuffs. . .	6,005,	5,989,	6,284,	5,596,	5,593,	5,148,	5,120,	5,774,	5,314,	5,452,	5,892,
„ Ribbons . . .	1,761,	1,795,	1,952,	2,267,	2,286,	2,701,	2,900,	3,142,	2,657,	2,676,	2,739,
„ Other Manufactures . . .	3,408,	2,739,	2,748,	2,405,	2,804,	2,533,	2,446,	2,873,	3,348,	3,051,	2,772,
Watches and Clocks (a). . .	1,011,	980,	1,043,	1,035,	1,093,	1,149,	1,055,	1,146,	1,187,	1,150,	1,204,
Woollen Goods . . .	5,982,	6,251,	6,832,	7,375,	8,068,	7,711,	8,803,	9,784,	9,322,	9,669,	9,839,
„ Yarn for weaving . . .	1,585,	1,831,	1,675,	1,774,	2,229,	1,906,	1,867,	2,204,	1,715,	1,634,	1,689,
All other Manufactures . . .	*17,500,	17,828,	17,687,	18,358,	17,639,	17,844,	19,467,	21,840,	21,996,	22,303,	22,284,
Total Manufactures . . .	*52,500,	52,881,	53,264,	53,418,	53,866,	54,135,	57,794,	64,263,	63,218,	65,082,	65,441,
Total Imports of all sorts . . .	413,020,	426,892,	390,019,	370,968,	349,863,	362,228,	387,636,	427,638,	420,692,	435,441,	423,892,

(a) Including parts of Watches since 1886, and parts of clocks since 1887.

* Estimated.

partly manufactured" goods was in 1891 almost the same as 1882. This does not mean that they have remained stationary during this period; they have, on the contrary, undergone considerable fluctuations, and as will be seen below, we are now really in a better position than we were ten years ago.

In the decade under consideration the total value of the trade of the United Kingdom (considered as the sum of the imports and exports) was at a maximum in 1883; it fell steadily until 1885 and rose again to a second maximum in 1890, since when a second trade depression, due in great part to a fall in prices, has set in. The maxima, in the case of exports, have occurred in the years preceding those of the imports (which occurred at about the same time as the maxima for our whole trade); the minimum, both of imports and exports, was in 1886. In 1890 the imports were less than in either 1885 or 1891. The exports of manufactures follow the export curve very closely, whereas the imports of manufactured articles show a continuous increase during the whole period, with the single exception of 1890. The rise during the first four years was gradual, but became very rapid with the revival of trade in 1888 and 1889. As remarked above, the net result of the decade is that the value of the exports of manufactured articles was very much the same in 1891 as in 1882. It must not be forgotten, however, that in 1882 exports reached a maximum; consequently a better idea of the actual condition of affairs is to be obtained by comparing 1890 (when they again reached a maximum), rather than 1891, with 1882. If this is done, it is at once seen that the second maximum is higher than the preceding one by nearly £12,000,000. [It is as yet too early to say whether the minimum in the present depression will prove to be lower than in 1885-6.]

The manufactured articles imported consist of silk goods, woollen yarns and stuffs, cotton goods, iron manufactures, glass, paper, &c., &c. The silks imported are valued at over £10,000,000 annually, and the leather (including gloves) at over £8,000,000 each of the other articles enumerated being estimated to be worth more than £2,000,000. We import more silk, leather, glass and paper than we export; but of the other goods mentioned, our exports are far in excess of our imports. All the above articles show an increase during the decennium.

Our principal export is textiles, cotton yarn and manufacture

alone being valued at more than the whole of our imports of manufactured articles. The imports of raw materials for textile purposes amount to about £90,000,000 annually, and yarns are imported to the value of another £3,000,000. It is practically these same materials which are re-exported after undergoing various processes; the only raw material produced in Great Britain for textile purposes being wool, in quantity perhaps about one quarter of the imports of that material. Thus, after retaining all the cotton, flax, wool, etc., required for home consumption, we are able to export a remainder, which, after passing through our factories, fetches some £110,000,000—exclusive of apparel, which is considered separately. [In 1892 the values both of imports and exports were lower.]

The fluctuations in the value of our textile exports are not so great as those exhibited by some other manufactures. In 1885 there is a decided minimum (as with the imports of raw materials); but between 1882 and 1892, the greatest value of textiles exported was £112,447,000 in 1890, and the least, £100,066,000 in 1892, a variation of little more than 12 per cent. from the figures of 1892; whereas during the same period the exports of metals varied by 47 per cent. from the minimum (in 1886), and the exports of manufactures as a whole by 21 per cent. The proportion formed by the textiles is generally a little over 50 per cent. of the exports of manufactures (it reached 55 per cent. in 1886). In the early part of the decade, the value of the textiles exported was more than double that of the manufactured articles imported; now, owing to the more rapid increase of this class of imports, they are about two-thirds as much again as these latter.

The exports of metals (whether wrought or not) show very large variations. From 1884 to 1885 there was a drop of £7,500,000, or nearly 15 per cent.; and during the four years following 1886 there was a rise of £5,000,000 per annum. Iron and steel form by far the principal items. Exports of machinery during the last three or four years show a considerable increase over the previous returns, nor did they decline so much last year as did most other articles.

Exports of "apparel and articles of personal use," and "chemicals and chemical and medicinal preparations" have remained fairly stationary, though fluctuating with the other exports.

Of the "other articles," arms, ammunition and military stores now account for some £1,500,000; till 1888 there had been a fairly

steady increase. Bags (empty) show a considerable and steady decline. Printed books (value in 1892, £1,289,000), as might be expected, increase from year to year; manufactures of caoutchouc have also increased (value in 1892, nearly £1,250,000). Railway carriages and waggons show very large variations. Their value in 1887 was £828,000; in 1888, £1,502,000; in 1890, £3,030,000 and in 1892, £827,000. They apparently suffer more from a depression than anything else. The Argentine Republic is partly responsible for these fluctuations; that State took carriages to the value of £227,000 in 1887; £1,270,000 in 1890; and £489,000 in 1891. Japan and British South Africa also took large quantities in 1890. Cement shows, on the whole, an increase, as do the products of coal (including naphtha, &c.), earthen and china ware, leather, seed-oil, painters' colours and materials, oil and floor-cloth, and paper. Most other articles have remained fairly stationary.

In attempting to ascertain the destination of our exports, and the countries from which our imports are derived, we are immediately met with the difficulty that, in our trade returns, the various articles are entered to the country to or from which they are shipped. Thus, Switzerland, having no ports, does not appear at all in the returns. Clocks and watches, which we undoubtedly receive thence, are accordingly noted as coming from France, Belgium, &c., and help to swell the returns of those countries. Bolivia has also, within the last three years, disappeared from the list of trading countries, owing to the few miles of coast formerly possessed by Bolivia having become Chilian territory. Our trade with the United States by no means consists entirely of goods received from, or destined for consumption in, that country. For example, the value of all the tobacco (manufactured or raw) exported to the United Kingdom from the Spanish West Indies amounted, in 1891, to only £545; it seems pretty clear, therefore, that large quantities from these islands must come to us through the States. The returns of our trade with our more distant and isolated possessions, such as Australasia, probably represent the facts more accurately.

Our cotton manufactures are distributed over all the world, and to most foreign countries and colonies they form a greater portion of our exports than do any other articles. As a rule, it may be said—though there are very numerous exceptions—that the less a country is developed, the greater is the demand for cotton

in preference to other goods. In the case of uncivilized countries like the Congo Free State and Abyssinia, the ratio of cotton goods to our total exports is as high as three-fifths or two-thirds.

Our best customer for cotton yarns and goods is British India: the exports to that empire during the ten years 1882-91 being valued at just £200,000,000, or at the rate of £20,000,000 annually for these materials alone. The most important countries in this respect, after India, are China (the only other country taking each year over five million pounds' worth of our cotton goods), Turkey (European and Asiatic), Germany, Brazil, the United States, Holland, Egypt, France, Belgium, and Java—the countries being arranged according to the annual values taken by each. The exports to Germany, Belgium, and Brazil have somewhat decreased during the decade, while to the Spanish Possessions, Italy, Chili, and Canada, the decline is more considerable. The Austrian Territories, Roumania, Egypt, Morocco, and Persia now require considerably more than they did ten years ago. In other countries there has not been any very striking change, though the returns for most are below the average in 1892. The demand in the United States, following a sudden fall after 1883, has been since that year slightly on the increase. It is as yet too early to say what the value of the "miscellaneous cotton goods," such as lace, hosiery, thread, etc. which form a large proportion of the cottons exported to the United States, amounted to last year; but that country is one of the very few which imported more piece goods from England in 1892 than in 1891.

Of the other textiles, the greatest proportion of yarns goes to Germany, especially linen, woollen, and cotton yarns, while Holland and Turkey also take considerable quantities of the latter. The manufactures of other textiles (more especially linen, jute, and woollen) are exported mostly to the United States; large quantities of jute and linen yarn are also shipped to Spain and the Canaries. The United States imports more silk from Britain than does any other country, France coming next in this respect, though this trade with France appears to be steadily declining.

Metals and manufactures thereof are exported principally to our own possessions, the demand generally being greatest in India. The articles of which that country takes more than any other are wrought copper, mixed or yellow metal, bar, angle, bolt, and rod iron, and railroad iron; it requires also large quantities of hoops, sheets, boiler

and armour plates, galvanised sheets, and cast and wrought iron (not otherwise enumerated). Australasia and British North America also purchase large quantities. Tin plates are a remarkable exception, for of a total value of £5,300,000 exported in 1892, no less than £3,700,000 represented the value shipped to the United States. Steam engines and parts thereof go principally to British India, Australasia, Germany, Russia, Brazil, and Holland; other machinery chiefly to India, Germany, France, United States, and Russia.

Apparel and articles of personal use are almost entirely exported to our own possessions, especially Australasia—in fact, the Colonies and India take fully four-fifths of the total value of such goods. Alkali, to the extent of at least one half the total, is sent to the United States. Other manufactures, with the countries to which they are mostly exported, are cement, earthen and china ware, books (to the United States), seed-oil (Germany), writing paper, saddlery, harness and stationery (Australasia).

There has been a striking change in the character of our trade with Germany during the decade. Our total trade with Germany is much the same in value now as it was ten years ago; but when the returns are analysed, it appears that our imports of “manufactured goods” have risen by some fifty per cent., whereas our exports of “manufactured and partly manufactured” articles have declined by about fourteen per cent. Our exported manufactures sent to Germany are of course still far superior in value to our imports of this class. The principal increase in our imports from Germany has been in those goods which we most largely export ourselves, such as cotton manufactures, metals and metal goods, linens and woollens; also china, drugs, glass, musical instruments, toys, etc. Similarly it is for the most part in these goods that our exports thither have declined, cottons, jute, linens, silks, and woollens, with iron manufactures, showing the greatest decrease. The woollen, linen, and jute yarns shipped to Germany have, however, increased, as have the products of coal. This all points to a noteworthy extension of the manufacturing industry in Germany.

As Holland and Belgium serve to some extent as countries of transit between us and Germany, we should expect them to yield similar results; this they do only in a minor degree. Our exports of iron to both these countries have decreased; whilst woollens from Holland, linens from Belgium, and leather from both, have increased.

As regards France, we now obtain from thence more copper and woollens than formerly, and less leather; at the same time our exports thither of cottons, hardware and cutlery, linens, iron, and silks have all declined.

The most noteworthy changes in our trade in manufactured articles (apart from cotton goods, which have been noted above), with other countries are that Japan now requires much more of our iron and machinery; that part of our West Indian trade now apparently passes through the United States; and that the South American countries show very variable results, and some extraordinary fluctuations, which are not surprising, seeing that most of these Republics are generally in a state of revolution or insolvency.

With the United States, as with Germany, our imports of manufactures have increased, while our exports have decreased. The principal increases in the imports from the United States have been in copper, leather, and iron manufactures, while cotton goods have declined. On the other hand, the States now purchase less British apparel, arms and ammunition, bags and sacks, glass, linen, cotton goods, hardware and iron, and more alkali, bleaching materials, cement, jute, machinery, and silk.

The following table exhibits the values of the most important manufactured articles shipped from the United States to Great Britain and Ireland, and *vice versa*, during the years 1882 and 1891.

IMPORTS FROM THE UNITED STATES.

	1882	1891
	£	£
Clocks	129,000	102,000
Copper (wrought and unwrought) . . .	69,000	1,503,000
Cotton Manufactures	382,000	227,000
Drugs (miscellaneous)	89,000	138,000
Iron and Steel Manufactures	177,000	498,000
Leather.	1,400,000	2,208,000
Manures	332,000	357,000
Musical Instruments	160,000	194,000
Oil Seed Cake	1,194,000	1,193,000
Skins and Furs, all sorts	676,000	497,000
Wood House Frames, &c.	118,000	195,000
Total Imports of all kinds from the United States	88,353,000	104,409,000

EXPORTS TO THE UNITED STATES.

	1882	1891
	£	£
Alkali	1,092,000	1,297,000
Apparel and Haberdashery	561,000	300,000
Arms and Ammunition	175,000	57,000
Bags and Sacks	168,000	17,000
Bleaching Materials	176,000	337,000
Books (printed)	343,000	401,000
Cement	124,000	422,000
Chemical Products	439,000	496,000
Products of Coal	18,000	96,000
Cotton Yarn	97,000	106,000
„ Manufactures	3,752,000	2,352,000
Earthen and China Ware.	896,000	902,000
Glass Manufactures	283,000	182,000
Hardware and Cutlery	509,000	242,000
Jute Yarn	108,000	34,000
„ Manufactures	897,000	1,419,000
Leather	132,000	181,000
Linen Manufactures	2,874,000	2,401,000
Machinery and Mill Work	626,000	989,000
Manure.	58,000	121,000
Iron (wrought and unwrought)	9,068,000	6,198,000
Painters' Colours and Materials	133,000	162,000
Silk Yarns	26,000	308,000
„ Manufactures	394,000	408,000
Skins and Furs, all sorts	893,000	1,000,000
Woollen Manufactures	2,995,000	3,178,000
Total Exports to the United States of <i>all</i> <i>kinds of British and Irish Produce only</i> }	30,970,000	27,545,000
Total Exports to the United States (in- cluding Foreign and Colonial Produce) }	38,709,000	41,066,000

TEXTILE MANUFACTURES.

BY SWIRE SMITH, Keighley.

The textile manufactures of the United Kingdom, chiefly embrace the practical manipulation of the fibres of cotton, flax, wool, mohair, alpaca, and silk. The following brief sketch of their early history and their remarkable development in the British Isles may be of interest to the general public.

The wearing of artificial clothing began with our first parents, and the references to the spinning and weaving of wool and flax go back to the earliest of the biblical records. Cotton fabrics of

wonderful beauty and fineness of texture were made in India long before that country was visited by the most ancient of the peoples of Europe. Columbus, when he discovered the West India Islands and the Continent of South America, found the cotton plant growing wild, and the natives using the material for apparel and fishing nets. Prior to the fourteenth century, however, there does not appear to be any trace of the manufacture of cotton goods in any portion of Western Europe, and until the latter half of the eighteenth century cotton was mainly used in England for candle and lamp wicks. Egypt is claimed as the first recorded home of the flax industry. Wool shares in antiquity with flax, and by some is accounted to be the first of the textile materials that was used for artificial clothing. Silk is mentioned as being in use in China as far back as 2,700 years before the Christian era. All these materials, with the exception of silk—which, in its natural state, has always been reeled in the form of yarn direct from the cocoon—were universally spun and woven by hand until the latter part of the eighteenth century, and it is estimated that considerably more than half the population distributed over the surface of the globe are still clothed in hand-made fabrics but little in advance of those of the most primitive times.

COTTON.—The great inventions which raised the United Kingdom from a pastoral country to the leadership of the world in the manufacture of textiles were first applied to the cotton industry. These inventions were the product of a few poor obscure Englishmen, and with modifications to suit the various materials they were soon afterwards applied to wool, flax, silk, and other fibres. It was in 1769 that Richard Arkwright, a barber in Preston, embodied and improved upon the inventions of others, and patented the “water-frame” for the spinning of cotton. Jas. Hargreaves, of Blackburn, invented and patented the “spinning jenny” in 1770; and in a few years afterwards Samuel Crompton united the principles of the “waterframe” and the “spinning jenny,” and gave to the world the “mule” spinning frame.

The beginnings of the factory system inaugurated by these industrial pioneers were crude and elementary. Horses soon superseded men in supplying motive power; and in 1790 small factories, of which many still remain, were erected on the streams in

the upland valleys of Lancashire and Yorkshire, and water-wheels took the place of horses. It was about a hundred years ago that James Watt's improved steam engine entered into competition with the water-wheel; but in many instances the timid manufacturers could not trust the mysterious steam engine, and employed it only to lift water on to a wheel, for they considered that water was the only possible source of steady motive power. In 1785 the power loom was invented by the Rev. Dr. Cartwright; the Jacquard loom in 1801 by Jacquard, of Lyons; and improvements in the application of the mechanical principles of carding, spinning and weaving machinery followed in rapid succession. The "dead spindle," of American origin, was introduced in 1831, and Heilmann, of Mulhouse, who invented the combing machine in 1846, adapted it from wool to cotton. Calico printing advanced from hand blocks to machine rollers, and from the primitive methods of hand engraving to the ingenious contrivances of the pentagraph machine and the application of chemical agencies.

Although there has been no great alteration in the principles embodied in the above inventions, there has been a constant improvement in the workmanship and in the power of economical and efficient production of every class of machine in use in the cotton trade.

LACE.—The lace trade, which has always been centred at Nottingham, has shown remarkable progress since the era of machinery. The loop machine, or stocking frame, was invented by William Lee in 1580, and the net twist lace machine by Heathcote in 1809, which has since been greatly improved by Leavers and others. Jacquard's loom was adapted to lace in 1837. Peddie's machine for lace curtains was invented in 1840. The modern lace frame is probably the most beautiful and perfect machine employed in any branch of textile manufacture.

CONSUMPTION OF COTTON IN THE UNITED KINGDOM.

	Lbs.
1701	1,985,868
1800	51,594,000
1850	569,800,000
1892	1,538,900,000

FLAX, JUTE, &c.—The culture and manufacture of flax can be traced back to a period of great antiquity in Ireland, where this

industry is carried on in Ulster, with Belfast as a centre. There are also large factories in Scotland and England. Jute, which is susceptible of a considerable variety of manufactures, finds its chief home in Dundee, in Scotland. In 1805 the mechanical spinning of flax was introduced into Ireland, and gradually hand spinning died out. Power loom weaving was not adopted till 1852; and, although since that time the bulk of the linen fabrics have been woven by power, the hand loom is still largely used in Ulster for the production of fine shirting linens, cambric goods and damasks, which have achieved a great reputation throughout the world.

WOOL, WORSTED.—The manufacture of wool is the oldest, and, until it was surpassed by cotton in the early part of this century, it was the largest and most important of the textile industries of the United Kingdom. The inventions of Hargreaves and Arkwright were successfully applied to wool as to cotton a century ago, and in the transition from hand to machine labour there were many conflicts and strikes between the supporters of the old and the promoters of the new system. With the advent of machinery and steam power, the trade deserted Norwich, which had been its chief seat for centuries, and became established in a number of towns in the north, with Bradford, Halifax, Huddersfield, and Leeds as centres. The first worsted factory was erected in 1784 at Dolphin Holme, near Lancaster, and the first in Bradford in 1793. Power looms were first applied to worsted in 1825. Heilmann's combing machine, invented in 1846, was followed by Lister and Donisthorpe's in 1850. In 1852 Lister (now Lord Masham) purchased Heilmann's patent, developed it in various ways, and by his improved machine practically superseded hand combing. The combing machine, by Isaac Holden, M.P., specially adapted for the fine Australian merino wools, was invented in 1850, the "Noble" in 1854, and other machines have since followed. The difficulty of spinning alpaca and mohair was overcome in 1836 by Titus Salt—afterwards Sir Titus Salt, Bart.—of Bradford; and at about this period cotton warps were first used along with worsted weft in the manufacture of mixed fabrics familiarly known to the world as "Bradford goods."

WOOLLEN.—Woollen shares with worsted as a kindred branch of the wool industry, the difference between the two not being easily described or understood. A worsted yarn is usually combed, the

fibres being arranged so as to lie smoothly in the direction of the thread and parallel to each other. A woollen yarn is invariably carded, the fibres being arranged so as to cross and overlap each other. Woollen fabrics are often milled or felted after wearing, thereby causing the fibres to interlock as much as possible, thus producing opaque woollen cloth. The trade is carried on in the "Tweed" districts and other parts of Scotland, in the south-west of Ireland, and in various parts of England, the chief centres being Leeds and Huddersfield. The manufacture of flannels, blankets, rugs, &c., has assumed large proportions in the Rochdale district and in the West Riding of Yorkshire.

SHODDY & MUNGO.—The waste products of wool, old clothes, woollen rags, worn-out stockings, &c., are worked up under the name of "shoddy" and "mungo" into cloth. A still lower grade of wool, called "abstract," is derived from rags containing cotton and linen. The "shoddy" industry is extensively carried on in Dewsbury and Batley, and it is estimated that 200,000,000 lbs. of rags are annually converted into cloth in Yorkshire alone.

CARPETS.—The carpet industry has made great progress not only in machinery, but in the variety and excellence of styles and colouring. Printed warps were introduced some fifty-five years ago, followed by the weaving of Brussels, Tournay velvet, tapestry, and tapestry velvet by power looms. The "Royal" Axminster carpets are now woven by power on the American loom patented in 1877, as also the chenille and other carpets of four yards or more in width. The leading centres for this industry are Kidderminster, Halifax, and Glasgow.

HOSIERY (Knit Goods, &c.).—Principally carried on in the counties of Leicester and Nottingham, where the industry has assumed large dimensions. The stocking frame invented by William Lee in the reign of Queen Elizabeth was worked by hands and feet. About 1844 circular frames worked by steam power were introduced. The first important automatic knitting machine for fashioned hosiery was patented by A. Paget, of Loughborough, in 1851. Mathew Townsend, of Leicester, invented the "latch needle" machine in 1854. Fancy hosiery of the most complicated styles and patterns is now chiefly made by machinery.

CONSUMPTION OF WOOL IN THE UNITED KINGDOM.

	Estimated English Wool. Lbs.	Imported Foreign and Colonial. Lbs.	Exports. Lbs.	Retained for Home Consumption. Lbs.
1800 . . .	96,000,000	9,000,000	—	105,000,000
1850 . . .	130,000,000	77,000,000	26,000,000	181,000,000
1892 . . .	153,000,000	762,000,000	448,000,000	467,000,000

SILK.—The silk industry has been less influenced by the great mechanical inventions than other leading textiles, from the fact that raw silk, in the form of reeled yarn, has always been largely imported in a condition ready for the dyer and weaver. The trade has languished in Spitalfields and Coventry, but there are many individual firms in Macclesfield, Nottingham, etc., that have been very enterprising and successful. The greatest modern development has been in “spun silk” and “schappe,” the waste from spoiled cocoons, etc., which is dressed and combed by machinery patented and brought to great perfection by S. C. Lister (Lord Masham). On the velvet power loom, patented by Lister, six pieces of velvet plush can be woven in one operation. The waste silk manufactures are now considered among the most attractive and valuable within the range of the textile arts, the largest and most important works being at Bradford and Brighouse.

POTTERY.

BY WILTON P. RIX.

A nation's pottery rather than its parchments furnish the most lasting historical record; and, together with its architecture, provide for posterity enduring evidences of the national character. For this reason, if for no other, the high achievements of the potters' art must ever command the respect and interest of all who visit these great international displays. The endless possibilities afforded by the varying combinations of its complex processes, the unlimited field laid open for exercise of the decorative fancy, and the scientific resource needed to bring these results to perfection, justly influence all in according to ceramics a high position among the industrial arts.

The natural resources of the British Isles have always afforded to British potters an opportunity of securing pre-eminence among Western nations for their manufactures. Nor have they been slow

to avail themselves of it. By persistent effort and enterprise they have, though at first with somewhat hesitating steps, brought the British pottery of the present-day into a position of the highest repute throughout the world, and this notwithstanding foreign competitors have to a large extent imported the self-same natural supplies for their own use, at some stages of their history even having the advantage of priority in experience and tradition.

It is hardly possible that the rapid progress which has marked the renaissance of pottery in this country during the Victorian era should be continuously maintained. It is, therefore, not surprising that for the last few years British manufacturers have addressed their efforts chiefly to advancing the excellence of their pottery, rather than to the production of new methods or of fresh manipulative treatments. It is true that there are some prominent exceptions, but as a whole the perfecting of existing processes, as distinguished from the evolution of new ones, marks the latest productions. The constant advances of science, and the diffusion of more accurate technical knowledge, have made the control of manufacture more complete than before, while the continual effort to improve the requisite machinery has allowed much greater economy in the output.

The depression of some markets has only tended to stimulate the enterprise of British manufacturers generally. Though some few may have been tempted to meet the demand for cheap but attractive pottery by a lower standard of workmanship and material, the more important houses have wisely bent all their energy to maintaining, or even increasing, the intrinsic merit of their wares, while economising by more skilful methods of manipulation. In decoration, the greater control of technical processes has perhaps tempted the designer into much elaboration; so that accuracy of detail, rather than robustness of design, has often been the *motif* of his treatment.

While it is true that the most successful examples of early ceramic art were produced by those ignorant of the scientific principles on which their results were based, it must be conceded that the delicate beauty and softness of effect now attained, as well as the exquisite finish and brilliant texture manifest in numerous modern examples, are largely, if not entirely, due to that knowledge.

Failing a subsidy, nothing but appreciative patronage can pro-

vide incentive for the manufacture of the highest types of ceramic work. The custom of modern times, which somewhat unwisely demands rapid change in fashion and continual novelty, also greatly hinders the potter from producing examples of the highest excellence.

The considerable intervals elapsing between the conception and completion of highly-decorated wares makes the acquirement of experience in new directions somewhat slow. In many cases the best results can only be secured by careful and gradual adjustment of details. Long before it has realised the best capabilities of a new mode, public taste has cast it aside altogether as "out of fashion." The great outlay and long technical experience required to bring new methods to perfection and carry them into execution therefore discourages all but the most enterprising potters from embarking on the production of those *chef d'œuvres* which have done so much to maintain the high reputation of British pottery in all parts of the world. So soon as the mere semblance of value is allowed to take the place of true excellence, the potter's art is gradually degraded to the level of the meretricious and the commonplace. Besides this, the reflex influence is to deter the best patrons from the purchase of really excellent work—in fact, to place pottery altogether outside the pale of *objets de vertu*.

Though it may be true that the indirect influence of Japanese art has of late years greatly affected the decoration of British pottery, in the present display the *motif* is largely induced by the French style, while some designers have successfully adopted treatments recalling the best examples of Sèvres and Dresden. But even these influences do not seem sufficient to include in them any just estimate of the whole, and there is a marked, though gradual, evolution by popular taste of a new type suggestive of the Oriental, yet as widely different from it as from all others.

The adoption of pottery for purely decorative purposes, or as an artistic accessory, though long customary in luxurious homes, has of late years become almost universal, and the astonishing increase in the demand for such productions is a distinguishing feature of the present decade.

The obvious advantages of a material so enduring, capable of treatments adapted to every style of architecture, and in which both

colour and texture can be brought into complete harmony with the surroundings, has justly commended its use for purposes of embellishment.

Nor is it possible to overlook the increasing tendency to rely only on form and colour to the exclusion of design. No doubt this is chiefly owing to the ephemeral character of much household decoration, which contemplates the use of pottery only as an accessory, to be abandoned with the hangings at the close of a season.

At the same time the taste for ornamentation on wares of utility has greatly increased; and the perfection to which transfer printing and similar mechanical methods have now been brought has largely influenced the improvement which has taken place. It is, however, doubtful whether the great facility of these methods has not checked the development of true art by giving more limited opportunity to hand-decorated designs, which allow far more scope for individuality of execution.

The general character of ornamental wares in England during late years has tended to less severity of treatment, the key of colour being brighter than hitherto. The *naturalesque* in design still holds the popular taste, to a large extent, though the influence of French decoration has of late somewhat modified this.

Approaching more closely the details of workmanship and technique, the bold outlines and important dimensions of many large works in china at once arrest the attention; especially when it is considered that the fitting of the various parts is accomplished without the use of ormolu mounts, so largely resorted to in former days. The exquisite finish attained is also worthy of remark. Especially is this to be noticed in the delicate paste modelling and gilding of the porcelain and china. The softly translucent vellum surface of some earthenware is strongly contrasted with the brilliant texture of glaze attained by other makers, each apparently carrying to high perfection qualities which have their respective charms, and affording, though by opposite methods, infinite pleasure both to eye and touch. By other means equally pleasing effects are secured in the revival of the beautiful ruby lustre, as unique in its treatment as it is excellent in its quality and colour. The diversified resources of the salt-glazed wares command the ac-

admiration and interest of the critic ; while for originality of method the "Marqueterie" or inlay ware, from the same source, will attract the attention of collectors equally with the "Mother of Pearl" backgrounds seen in some examples. Some houses have been fortunate in identifying their productions with the work of skilled designers, who have left on the respective wares an abiding influence, full of chaste beauty ; in these instances again arriving at equally remarkable results by paths altogether divergent in technical methods. The happy coincidences which have thus brought together the best resources of the potter's skill and high artistic perception seldom devoted to ceramics, have allowed the production of examples unrivalled in modern times.

An equally important advance is again to be traced to the same efficient control of processes in the coarser wares. In enamelled fire clay the large dimensions, perfection of body and hardness of glaze should be noticed, especially because it must be remembered that the difficulty of attaining all these qualities increases at a heavy ratio with each advance in size. In constructive and architectural science the truth of form, excellence of design, and pleasant range of tone available have rightly combined to place this material in high estimation. Its production has perhaps made greater progress than any other class of pottery during the last ten or fifteen years, and much enterprise has been devoted to its manufacture. Contrasted with this, the Doulton ware fountain placed in the grounds of the Victoria House is an interesting example of a new application of pottery. For durability, as well as for harmony of tone, it will no doubt commend itself to some as worthy to take important rank for such purposes.

In the present display excellent examples of mural and floor tiles are represented. The dangerous tendency to hardness of design, resulting from mechanical repetition in metal moulds, has been in many cases adroitly concealed by the methods employed, and little more can be wanting than is already available for the adequate decoration of walls and floors in this cleanly and impenetrable material. The skilful building up of moulded pilasters, cornices and dados from small and interchangeable members gives economy, without in many cases foregoing breadth of design, while the excellent truth of form leaves nothing more to be desired.

The use of pottery for the construction of fireplaces and mantelpieces marks one of those discriminating revolutions in public taste so characteristic of the times. Fire-clay, when properly constructed, is unrivalled for this purpose, conserving, as it does, for subsequent gradual radiation the heat too rapidly produced for the requirements of the moment. Much skill and enterprise have been devoted during late years in perfecting enamels and glazes suitable for its decoration, and in designing forms best adapted for the material. The examples now produced will commend it for cleanliness and beauty as well as efficiency.

The advances of science in Chemistry, Electricity, and Metallurgy, as well as in Sanitation, have all laid pottery under tribute for the production of apparatus suitable to the various requirements, and the adaptation of material to these purposes has lately received the unremitting attention of some manufacturers. The composition of clays in some districts of the British Isles appear to be peculiarly suited to these purposes, and the important examples of large stoneware vessels, acid taps, pumps and crucibles (all of unusual dimensions), show that this particularly useful section of British pottery has well maintained its position.

If cork, caoutchouc, and glass have greatly assisted scientific discoverers in their research, it may be said with equal truth that stoneware, fireclay, and plumbago have afforded to the scientific producer the possibility of equally important results, and on this account the progress of this branch of pottery must have an increasing interest.

When compared with that of other nationalities, British pottery holds a firm position, being generally original in design, diversified in detail, and excellent in *technique*. Though not perhaps so light and fanciful in conception as the French, nor so realistic as much of the Italian, nor showing the same skill in reproduction as the German examples, the British manufactures in this class give evidence of solid worth, gracefully yet substantially embellished, and without undue effort at mere effect.

DEPARTMENT H.

MANUFACTURES.

*Unless otherwise stated, the Exhibits in this Department are in the
Manufactures Building (Ground Floor).*

GROUP LXXXVII.

CHEMICAL AND PHARMACEUTICAL PRODUCTS.—DRUGGISTS' SUPPLIES.

277 Alexander & Co., Limited, James, *Lambeth Soap Works, London, S.E.*

Hamaurelis refined pumice soap, fancy soaps, cosmetics and perfumery.

278 Allen & Sons, Stafford, *7 Cowper Street, Finsbury, London, E.C.*
[See Advt.]

Expressed and essential oils.

279 Atkinson, J. & E., *24 Old Bond Street, London, W.* [See Advt.]

Essences, bouquets, eau de Cologne, lavender waters, and all kinds of perfumes for the handkerchief, perfumed powders, toilet soaps, toilet powders, washes and other preparations for the hair, dentifrices, toilet vinegars, and all kinds of toilet accessories.

280 Bigg, Thomas, *Great Dover Street, Borough, London, S.E.*
Sheep-dipping compositions.

281 Bishop & Sons, Limited, Alfred, *48 Spelman Street, Mile End New Town, London.*

Granular effervescent preparations.

282 Brunner, Mond & Co., Limited, *Northwich, Cheshire.*

Pure alkali, soda crystals (sal-soda), sesqui-carbonate of soda (concentrated sal-soda), and bicarbonate of soda, sulphate and muriate of ammonia, bleaching powder.

283 Bryant & May, Limited, *Fairfield Works, Bow, London, E.*
Vestas, matches, wax tapers and braided lights.

284 Burroughs, Wellcome & Co., *Snow Hill Buildings, London, E.C.*
Medicine chests and cases, tabloids, Kepler preparations and other pharmaceutical products.

- 285 Calvert & Co., F. C., Manchester, England.** [See Advt.
Carbolic acid for medicinal, surgical, veterinary and disinfecting purposes, carbolic soaps, carbolic toilet and sanitary preparations, disinfecting powders, pharmaceutical preparations.
- 286 Christy & Co., Thomas, 25 Lime Street, London, E.C.**
Kola and other pharmaceutical preparations; "Christia," a new surgical dressing, water and spirit proof; Morstadt cachets, cachet closing apparatus; "Palma Christi" (Dr. Standke), a new castor oil.
- 287 Crown Perfumery Co. (The), 48 Old Bailey, London, E.C.; New York; and Paris.**
Perfumery and toilet requisites.
- 288 Ellison, Jun., Henry, Whitechapel Road, Cleckheaton, Yorks.**
Carboline, fluid powder and soap, carbolic acid, "all round dip automatic disinfecter."
- 289 Gosnell & Co., J., 93 Upper Thames Street, London, E.C.**
Cherry blossom perfume, toilet powder and soap, cherry tooth paste, and perfumery generally.
- 290 Jackson, Thomas, 43 Great Ducie Street, Strangeways, Manchester.** [See Advt.
"H.R.H. Prince Albert" cachoux for perfuming the breath.
- 291 Lever Brothers, Limited, Port Sunlight, near Birkenhead.** [See Advt.
Soaps, and glycerine.
- 292 Mouilla Potash Liquid Soap Co., Limited (The), 6 Adam Street, Adelphi, London, W.C.**
Mouilla liquid toilet soap.
- 293 Ness & Co., Darlington.** [See Advt.
Thymo-cresol disinfecting, antiseptic and insecticidal fluids for destroying germs of diseases and all noxious insects upon animals and plants, and for sheep-dipping purposes; also, as powders and soaps.
- 294 Newball & Mason, Hyson Green Works, Nottingham.**
Mason's root beer extracts; dried herbs.
- 295 Oppenheimer, Son & Co., Limited, 14 Worship Street, London, E.C.**
Pharmaceutical preparations.

296 Pain & Sons, James, 121 *Walworth Road, S.E., and St. Mary Axe, E.C., London.*

Fireworks, ship signals, illuminations.

297 Patent Borax Company (The), *Ledsam Street, Ladywood, Birmingham.* [See Advt.]

"Californian" borax, borax extract of soap, dry soap, starch glaze, and other preparations for arresting decay, washing, cleaning and purifying.

298 Pears, Limited, A. & F., 71-75 *New Oxford Street, London, W.C.* [See Advt.]
Transparent toilet soap.

299 Quibell, Bros., *Newark-on-Trent.* [See Advt.]

Sheep-dips, disinfectants, toilet and other soaps; glues, and seeds.

300 Ransom & Son., W., *Hitchin, near London.*

English pharmaceutical extracts, essential oils, expressed juices, dried herbs.

301 Smith & Co., T. & H., *Edinburgh; and 12 Worship Street, London, E.C.* [See Advt.]

Morphine, codeine, aloin, resin of scammony, caffeine, gingerine, salicine and other chemical products of a pharmaceutical nature.

302 Sprules, Sarah, *The Distillery, Wallington, Surrey.*

Peppermint, lavender, rosemary, camomile, pennyroyal, and other essential oils, lavender water, and essence, and other perfumes

303 Stevenson & Howell, *Standard Works, Southwark Street, and Old Paris Gardens, London, S.E.; and at Glasgow, Manchester, Birmingham, Bristol, Paris, Sydney and Melbourne.*

Essential oils, soluble fruit and other essences for aërated waters, compound fruit essences for confectionery, cordial and liqueur essences, caramels, liquid and vegetable colours, fruit acids (free from lead), and all ingredients for manufacture of aërated waters, confectionery, biscuits; otto de rose, oil santal wood, tobacco and other perfumes.

304 United Alkali Co., Limited (The), Liverpool.

Bleaching powder; salt cake; soda (caustic and carbonates all strengths, refined alkali, pure alkali by ammonia process, crystal carbonate, bi-carbonate, crystals, chlorate); potash (caustic, carbonate, chlorate); calcium chloride; salt ("Buffalo" brand—factory-filled); strontia salts, sulphate of alumina; recovered sulphur; ingot copper, sulphate of copper, purple ore in bulk or bricks; fertilizers; ammonia, sulphate, muriate (refined and grey); baryta chlorate, sal ammoniac; ultramarine.

305 Usher, Richard, Bodicote, Banbury, Oxon.

Rheubarb, henbane, and other indigenous medicinal herbs; pharmaceutical extracts.

306 Zeno & Co., 39 Wilson Street, Finsbury Square, London, E.C.; Export bonded factory, "I" Warehouse, St. Katherine's Docks, London, E.

Perfumery, extracts, eau de Cologne, toilet soaps, toilet powders, preparations for the hair, and other toilet requisites.

See fuller's earth, GROUP XLVII.

Amines Syndicate, Limited. *See GROUP CXLVII.*

Birmingham Vinegar Brewery Co. *See GROUP XXIII.*

Bradford Coffee Tavern Co., Limited. *See GROUP X.*

Curtiss & Harvey. *See GROUP CXIII.*

Edmunds, Joseph. *See GROUP XXIII.*

Eley Brothers. *See GROUP CXIII.*

Hodges, Edward. *See Indian Exhibits.*

Ingham's Eucalyptus Oil Co. *See GROUP XVIII.*

Lorrain, James. *See GROUP CXXVIII.*

Price's Patent Candle Co., Limited. *See GROUP XVIII.*

Riddle & Co., Alexander. *See GROUP XXI.*

Rose & Co., Lauchlan. *See GROUP XXI.*

GROUP LXXXVIII.

PAINTS, COLOURS, DYES AND VARNISHES.

307 Arnold, P. & J., 155 Aldersgate Street, London, E.C.

Writing and copying inks; mucilage gums, sealing waxes.

- 308 Berger & Sons, Limited, Lewis, Homerton, London, N.E.; and Lead Works, Sheffield, Yorkshire.** [See Advt.]

Dry colours for painting, printing, litho, oil and table cloth manufacturers, coach painters, decorators, and general work, tube colours for artists, white, orange, and red leads, oil and spirit varnishes for all purposes.

- 309 Bond, John (now J. Hickisson), 75 Southgate Road, London, N.**

Crystal Palace John Bond's marking ink and appliances for marking linen, cotton, and other textiles, writing and copying inks of every description, rubber stamps and stencil plates, cement for mending china and glass, patent disinfecting pen, patent disinfecting inks.

- 310 Dales, John T., 85 Melbourne Grove, East Dulwich, London, S.E.**

Dubbin (brown and black) for harness and boots, and for all leather goods.

- 311 Day & Martin, 49-60 Borough Road, London, S.E.; and Liverpool.** [See Advt.]

Boot blacking, polishes for ladies' boots and brown leather boots harness blacking, furniture polish, Brunswick black.

- 312 Duckett & Co., J. B., Inkmakers, Heeley, Sheffield.**

Writing inks, and ink powders.

- 313 Harrison & Son, Phœnix Chemical Works, Hanley, Staffordshire.**

Colours, glazes, and enamels for potters' use, also colours for glass manufacturers, and enamels for glazed brick makers.

- 314 Madderton & Co., Loughton, Essex. Agent in America, Macklin & Co., Colorado Springs, Colorado.**

The "Cambridge" colours; a selected palette of durable pigments and vehicles for artists.

- 315 Winsor & Newton, Limited, 37-40 Rathbone Place, W., and North London Colour Works, Kentish Town, N.W., London; and 84 William Street, New York.**

Artists' colours and materials, decorative colours, and printing inks.

Suter, Hartman and Rahtjen's Composition Co., Limited.
See GROUP LXXXV.

Weeks & Son, J. W. See GROUP LXXXV.

GROUP LXXXIX.

TYPEWRITERS, PAPER, BLANK BOOKS, STATIONERY.

- 316 Cleghorn, Jun., William,** *Clephington Works and Albert Mill, Dundee.* [See Advt.]

Paper stock; wool, waste, and felt (hair and tarred); jute cloth; jute yarns.

- 317 Cotterell Brothers,** 11 *Clare Street*, 8 *Baldwin Street*, and 2 and 6 *March Street, Bristol*; and 5 *Bridge Street, Bath.*

Art paper hangings and other decorative materials for walls and ceilings.

- 318 Ford, T. B.,** *Snakeley Mills, Loudwater, near High Wycombe, Buckinghamshire.* [See Advt.]

Samples of Ford's 428 mill blotting paper (varieties: white, pink, deep pink, buff, blue, mauve, antique, and green, in various [thicknesses]), also raw materials from which manufactured.

- 319 Gestetner, D.,** 70 & 71 *Chiswell Street, London, E.C.* [Mft. G.]
Automatic cyclostyle, duplicating apparatus.

- 320 Gillott & Sons, Joseph,** *Victoria Works, Graham Street, Birmingham.*

Pens of all kinds; specimens of pens in various stages of manufacture, and elaborately pierced, ground, and coloured ornamental steel pens, the colours on which are produced by the application of heat alone, no colouring matter being used.

- 321 Jeffrey & Co.,** 64 *Essex Road, Islington, London, N.* [See Advt.]

Wall papers (hand and machine printed), decorations for interiors, raised and coloured flocks enriched with metal; embossed and ornamented leathers and leather papers (all free from arsenic); embossed and decorated leather portières, subjects: "The Amorini," and the "Peacock Garden," designed by Walter Crane.

- 322 Knowles & Co., Chas.,** *Blenheim Works, 164 and 166 King's Road, Chelsea, London, S.W.* [See Advt.]

Art wall and ceiling papers.

- 323 Maskelyne & Son, J. N.,** *Egyptian Hall, London, W.* [Gallery.]

Typewriters without ink ribbons, visible work, permanent alignment, and differential spacing.

324 Mynsbrugge, Mary P., *Grapho House, Ranelagh Road, Leytonstone, Essex.* [Gallery.]

"Million" typewriter, a keyed type-bar machine.

325 Ward & Co., Limited, Marcus, *Royal Ulster Works, Belfast; Oriel House, Farringdon Street, London, E.C.; and 734 Broadway, New York.*

"Royal Irish Linen" and other writing papers and envelopes; children's books, Sunday-school reward cards, calendars, and chromo-lithographic publications; metallochrome.

326 Woollams & Co., Wm., *110 High Street (near Manchester Square), London, W.* [See Advt.]

Wall and ceiling papers (block printed), guaranteed free from arsenic, raised flock papers for painting over, decorative wall papers, friezes, borders, dadoes, patent embossed flock papers with design modelled in relief and coloured without painting over, "anaglypta," an embossed material, in private designs; embossed leather for dadoes, screens, and other decorative purposes.

Zaehnsdorf, Joseph. See GROUP CL.

GROUP XC.

FURNITURE OF INTERIORS, UPHOLSTERY, AND ARTISTIC DECORATION.

327 Arup Brothers, *120 New Bond Street, London, W.*

Decorations for the interior of dwelling-houses.

328 Burroughes & Watts, Limited, *19 Soho Square, London, W.; Bond Street, Sydney, N. S. W.; Deansgate, Manchester; Broad Street corner, Birmingham; Northumberland Street, Newcastle-on-Tyne; West Nile Street, Glasgow.* [See Advt.]

Full size billiard table for the English game, fitted with "Eureka" patent steel block cushions, also one for the American cannon game.

329 Davis & Co., W. H., *Anchor Works, Macdonald Street, Birmingham.*

Brass and iron bedsteads.

330 Collinson & Lock, 76 to 80 Oxford Street, London, W.

Specimens of dining- and bed-room fitted up with suitable hangings and appropriate furniture, china, art objects, and water-colours; furniture of various descriptions, examples of marqueterie, ivory inlaying, carving; repoussé work, including electrical fittings.

331 Elliott, James, 54 Brook Street, London, W.

Decorative hangings and furniture of interiors, lustra painting; bossa facilis (a method of embossing and decorating metal).

332 Gregory & Co., 212, 214, 216 Regent Street, and 44-46 King Street, London, W.

Carved walnut sideboard, side table, chimney piece and over-mantel, chairs, settee, and decorations in Italian style, carved mahogany Chippendale bookcase, chairs, tables and decorations.

333 Hampton & Sons, Pall Mall East and Cockspur Street, Charing Cross, London, S.W. Works, 43 Belvedere Road, London, S.E.

[See Advt.]

Facsimile reproduction of the banqueting hall of Hatfield House, England, the seat of the Marquess of Salisbury.

334 Hoskins & Sewell, Bordesley, Birmingham.

[See Advt.]

Metallic bedsteads.

335 Johnstone, Norman & Co., 67 New Bond Street, London, W.

[See Advt.]

Patent circular expanding dining table, patent circular expanding and extending dining table; a collection of inlaid and carved panels in a variety of woods and metals, illustrating their adaptation to cabinet work. (See also Complimentary List, page xxxiv.)

336 London Fabric Printing Co., 278 Deptford Lower Road, London, S.E.

Printed curtains, cretonnes, floor and wall coverings.

337 McCaw, Stevenson, & Orr, Limited, Linenhall, Belfast.

Glacier window decoration, a substitute for stained glass.

338 Macbeth, Isaac, Wirksworth, near Derby.

Chippendale, marqueterie and inlaid furniture.

339 Peyton & Peyton, Bordesley Works, Birmingham.

Brass and iron bedsteads.

- 340 Roberts, Geo.,** 379 *Bramall Lane, Sheffield.*
Antique carved oak and decorative furniture.
- 341 Winfields, Limited,** *Cambridge Street Works and Rolling Mills, Birmingham; and 49 Farringdon Street, London, E.C.*
Brass bedsteads, brass cot, and brass eagle lectern.
- 342 Wright & Co., Geo.,** 162-164 *Westminster Bridge Road, London, S.E.* [See Advt.
Full-size billiard table and fittings to match.

See various exhibits in GROUPS LXXXIX. and C. to CIII.

Ardeshir & Byramji. *See Indian Exhibits.*

Bhumgara & Co., F. P. *See Indian Exhibits.*

De Forest Lockwood. *See Indian Exhibits.*

Hitching & Wynn. *See GROUP LXXXIII.*

Marwanjee & Co., P. *See Indian Exhibits.*

Tellery & Co., S. J. *See Indian Exhibits.*

GROUP XCI.

CERAMICS AND MOSAICS.

- 343 Ault, William,** *Swadlincote, near Burton-on-Trent.* [See Advt.
Artistic pottery.
- 344 Brown-Westhead, Moore & Co., T. C.,** *Cauldon Place, Staffordshire Potteries.* [See Advt.
"Cauldon" china and earthenware.
- 345 Coalport China Co. (John Rose & Co.), Limited (The),** *Coalport, Shropshire.*
China of all descriptions.
- 346 Daniell & Sons, A. B.,** 42-46 *Wigmore Street, London, W.*
Fine porcelain and earthenware.
(*See also Complimentary List, page xxxiii.*)
- 347 Doulton & Co.,** *Lambeth, London, S.E.; and Burslem, Staffordshire.* [See Advt.
China and earthenware, Doulton ware, marqueterie ware, Crown Lambeth ware, decorated stoneware, ceramic wall decorations.
(*See also Complimentary List, page xxxiii.*)

- 348 **Gibson & Sons**, *Albany Works, Moorland Road, Burslem, Staffordshire.* [See Advt.
Jet goods (plain and decorated) and Rockingham ware.
- 349 **Godwin & Hewitt**, *Victoria Tile Works, Hereford.*
Enamelled, encaustic and other tiles.
- 350 **Grainger & Co., George**, *Royal China Works, Worcester (carried on by the same proprietary as the Royal Porcelain Works).*
Specimens of perforated porcelain and other wares made at the works.
- 351 **Maw & Co., Limited**, *Benthall Works, Jackfield, R.S.O., Shropshire.* [See Advt.
Tiles and mosaics of every description for pavements, walls, bathrooms, fire-places, and other purposes; architectural faïence pottery.
- 352 **Moore Brothers**, *St. Mary's Porcelain Works, Longton, Staffordshire.*
China tea, breakfast and dessert ware, ornamental table decorations, candelabra, lamps, vases, pâte-sur-pâte.
- 353 **Peake, Thomas**, *The Tileries, Tunstall, Staffordshire.*
Bricks and tiles.
- 354 **Worcester Royal Porcelain Co., Limited (The)**, *Worcester.*
Exhibit comprising a variety of objects both useful and ornamental in various styles; the specialities including ivory porcelain, with encrusted gold and colour decorations, ivory and "coral rose," Pompeian green, coloured grounds, decorative flower-painting, lamps, candelabra, jardinières and flower-pots, table decorations, figures and statuettes in stained ivories; a selection of tea, breakfast and dessert services in china, "Royal Worcester vitreous" dinner sets.
- See also exhibits in GROUP XLVI.*
- Ardeshir & Byramji.** *See Indian Exhibits.*
- Bhumgara & Co., F. P.** *See Indian Exhibits.*
- Fawcett, Thomas C.** *See GROUP LXXVIII.*
- Irish Portland Cement and Brick Co., Limited.** *See GROUP XLVII.*
- Marwanjee & Co., P.** *See Indian Exhibits.*
- Tellery & Co., S. J.** *See Indian Exhibits.*

GROUP XCII.

MARBLE, STONE AND METAL MONUMENTS, MAUSOLEUMS, MANTELS, &c.—
CASKETS, COFFINS, AND UNDERTAKERS' FURNISHING GOODS.

355 O'Neill & Co., P. J., 182 *Great Brunswick Street, Dublin.*
[Mines B.]

Baptismal font of Irish marbles, statue of the Redeemer—"I am the Resurrection and the Life," Celtic cross in native (Co. Donegal) sandstone, being a copy of the ancient cross of Kilkispeen, co. Kilkenny.

356 Pettigrue, Thomas, *Ardbraconn Quarries, Navan, Co. Meath.*
[Mines B.]

Celtic cross fully carved, monuments, rough crosses, pedestals for figures.

Flynn & Co., Thomas M. H. See GROUP XLIV.

Hems & Sons, Harry. See GROUP XCVI.

GROUP XCIII.

ART METAL WORK—ENAMELS, ETC.

357 Doig & Co., William, 175 *New Bond Street, London, W.*

Bronze replicas of Robert Burns' statue in Ayre, "Dominie Sampson," "Prodigious" in bronze, Jubilee Celebration in Abbey (1877) in photogravure.

Ardeshir & Byramji. See Indian Exhibits.

Bhumgara & Co., F. P. See Indian Exhibits.

Collinson & Lock. See GROUP XC.

Elliott, James. See GROUP XC.

Goldsmiths' & Silversmiths' Co. See GROUP XCVII.

Johnson, Edmond. See GROUP XCVIII.

Marwanjee & Co., P. See Indian Exhibits.

Steel & Garland. See GROUP CXV.

Tellery & Co., S. J. See Indian Exhibits.

Winfields, Limited. See GROUP XC.

GROUP XCIV.

GLASS AND GLASSWARE.

- 358 Cannington, Shaw, & Co., Limited, *Sherdley Glass Works, St. Helens, England.* [See Advt.]

Glass bottles of all descriptions and for all purposes.

- 359 Hartley & Co., Limited, James, *Wear Glass Works, Sunderland.*

Glassware.

GROUP XCV.

STAINED GLASS IN DECORATION.

- 360 Hardman & Co., John, *25 Cockspur Street, London, S.W.* [Window.] [See Advt.]

Pictorial paintings on glass, ecclesiastical art.

- 361 Holiday, Henry, *Oak-Tree House, Branch Hill, Hampstead, London, N.W.* [Window.]

A stained glass window representing the Nativity, with the adoration of the magi and shepherds, and the choir of angels (designed and executed by Henry Holiday).

- 362 Pace, Ion, *252 Fulham Road, London, S.W.* [Gallery.]

Stained glass windows and designs.

- 363 Winfields, Limited, *Cambridge Street Works and Rolling Mills, Birmingham; and 49 Farringdon Street, London, E.C.* [Window (screen).]

Screen of stained glass windows, domestic, civic and ecclesiastical.

GROUP XCVI.

CARVINGS IN VARIOUS MATERIALS.

- 364 Hems & Sons, Harry, *Ecclesiastical Art Works, Exeter.*

Carved rood beam for erection in the chancel arch of a church and other samples of church furniture; also series of photographs illustrative of sculptured and carved work, executed in various materials, and carried out by the firm at different times.

See art metal-work, GROUP XCIII.

See sculpturing, carving and modelling in porcelain, pâte-sur-pâte, GROUP XCI.

Ardeshir & Byramji. *See* Indian Exhibits.

Bhumgara & Co., F. P. *See* Indian Exhibits.

Collinson & Lock. *See* GROUP XC.

De Forest Lockwood. *See* Indian Exhibits.

Higham, Joseph. *See* GROUP CLVIII.

Johnstone, Norman & Co. *See* GROUP XC.

Marwanjee & Co., P. *See* Indian Exhibits.

GROUP XCVII.

GOLD AND SILVER WARE, PLATE, ETC.

365 Goldsmiths' and Silversmiths' Co., 112 *Regent St., London, W.*

Jewellery, diamond and other gem ornaments; presentation plate, prize cups, dessert services, tea and coffee sets, coffee trays, toilet services; electro-plate, and cutlery suitable for clubs, hotels, and private dwellings; ships' chronometers, and ladies' and gentlemen's, of English workmanship; clocks, suitable for the dining room, drawing room, and travelling; dressing bags, ladies' and gentlemen's. (*See also* Complimentary List, page xxxiv.)

366 Gibson & Co., Limited, *Donegall Place, Belfast.*

Plate and jewellery.

367 Mappin Brothers, 220 *Regent Street, W., and 66 Cheapside, E.C., London; and Queen's Works, Sheffield.*

Silver plate, electro plate ("Queen's Plate," regd.); cutlery; dressing and travelling bags.

368 Wells, John, 508 *Oxford Street, London, W.* [See Advt.

Old English, Irish and Scotch silver plate, and historical articles.

See electro-plating, GROUP CXXXI.

Ardeshir & Byramji. *See* Indian Exhibits.

Bhumgara & Co., F. P. *See* Indian Exhibits.

Das & Gopinath, Bhugwan. *See* Indian Exhibits.

Johnson, Edmond. *See* GROUP XCVIII.

Marwanjee & Co., P. *See* Indian Exhibits.

Tellery & Co., S. J. *See* Indian Exhibits.

GROUP XCVIII.

JEWELLERY AND ORNAMENTS.

369 Johnson, Edmond, 94 *Grafton Street, Dublin.*

Facsimile copies of Irish art metal work, crosses, croziers, shrines taken from the collection of the Royal Irish Academy and Trinity College, Dublin; antique Irish silver articles.

Ardeshir & Byramji. *See* Indian Exhibits.

Bhumgara & Co., F. P. *See* Indian Exhibits.

Doyle & Co., Harry. *See* Indian Exhibits.

Gibson & Co., Limited. *See* GROUP XCVII.

Goldsmiths' and Silversmiths' Co. *See* GROUP XCVII.

Laird, G. & S. (Misses). *See* GROUP CVI.

Marwanjee & Co., P. *See* Indian Exhibits.

Tellery & Co., S. J. *See* Indian Exhibits.

GROUP XCIX.

HOROLOGY—WATCHES, CLOCKS, ETC.

370 Smith & Sons, John, 18 and 22-24 *St. John's Square, Clerkenwell, London, E.C.*

Musical, chime quarter, ship's bell, turret, regulator and other clocks, watches, time bells.

See chronometric apparatus, GROUP CLI.

Goldsmiths' & Silversmiths' Co. *See* GROUP XCVII.

GROUP C.

SILK AND SILK FABRICS.

- 371 Courtauld, & Co., "Limited," Samuel, 19 *Aldermanbury, London, E.C.*

Silk crapes, fancy silk gauzes in colours, and other silk fabrics ; costumes of same.

- 372 Collinson & Lock, 76 to 80 *Oxford Street, London.*

Silks, damasks, brocades, brocatelles, gold and silver tissues and velvets, embroideries.

- 373 Clayton, Murgatroyd & Co., Limited, *Wellington Mills, Halifax.*
Spun silk yarns.

- 374 Fry & Co., 115 and 116 *Cork Street, Dublin.*

Silk taborets, lute strings, poplin damasks ; carriage laces and trimmings.

- 375 Grout & Co., 12 *Foster Lane, London, E.C.* [See Advt.

Black and coloured silk crapes, crepons, crêpe scarves, handkerchiefs, shawls, mousseline de soie, grenadines brochée and other fabrics.

- 376 Grant & Co., W. H., *Foleshill, Coventry.*

Raw and dyed silks, woven suspenders, garters, handkerchiefs, tapes, ornaments, laces, braids, badges and other silk goods.

- 377 Hinde & Sons, Francis, *St. Mary's Silk Mills, Norwich* ; 3 *Blue Boar Court, Friday Street, London* ; 42 *Rue de Clery, Paris* ; *New York depot, Messrs. Openhym & Sons, Greene Street.*

Silk crapes—ordinary and waterproof finish—for mourning.

See laces, GROUP CVI.

See hosiery and gloves, GROUP CIV.

Ardeshir & Byramji. See Indian Exhibits.

Bartrum, Harvey & Co. See GROUP CIII.

Bhumgara & Co., F. P. See Indian Exhibits.

Ferguson Brothers. See GROUP CII.

Grant & Co. *See* GROUP LXXII.

Houssein, M. D. *See* Indian Exhibits.

Neilson, Shaw & Macgregor. *See* GROUP CIII.

Shaw & Co., Jhoomuck. *See* Indian Exhibits.

Shaw, Chadee Lall. *See* Indian Exhibits.

Shaw, M. L. *See* Indian Exhibits.

Tellery & Co., S. J. *See* Indian Exhibits.

Marwanjee & Co., P. *See* Indian Exhibits.

GROUP CI.

FABRICS OF JUTE, RAMIE AND OTHER VEGETABLE AND MINERAL FIBRES.

378 Barry, Ostlere & Co., Limited, John, Kirkcaldy, Scotland.
[*See* Advt.]

Floor oil cloths, sanitary linoleums, and cork carpets.

Bartrum, Harvey & Co. *See* GROUP CIII.

Belfast Ropework Co., Limited. *See* GROUP LXXXV.

Cleghorn, Jun., Wm. *See* GROUP LXXXIX.

Combe, Barbour & Combe, Limited. *See* GROUP IX.

GROUP CII.

YARNS AND WOVEN GOODS OF COTTON, LINEN AND OTHER
VEGETABLE FIBRES.

379 Barbour & Sons, Limited, William, Lisburn, Ireland.

Linen threads for tailors and shoemakers (hand and machine sewing), linen yarns; linen lace threads and flax embroidery threads; fishing threads and nets.

380 Barlow & Jones, Ltd., 2 Portland Street, Manchester; and Albert Mills, Cobden Mills, Egyptian Mills, Prospect Mills, Bolton.
[*See* Advt.]

Counterpanes (bedspreads), toilet covers, bureau covers, tidies, white, coloured, hand-printed, and hand-embroidered, cotton and linen Turkish and other fancy towels and bath sheets, plain and figured, piqués, white and coloured, flannel-back piqués, swans-downs, flannelettes, linings, dimities and damasks, white and printed, sheets and sheetings. (*See also* Complimentary List, page xxxiii.)

381 Behrens & Sons, Sir Jacob, 36 Princess Street, Manchester.

Cotton yarns suitable for manufacture of all cotton, wool and silk fabrics.

382 Brookfield Linen Co., Limited, Belfast.

Linen and tow yarns; interlinings, diapers, huckabacks, handkerchiefs, rollerings, towels, damasks, napkins, buckrams, canvas, paddings, coating dress mantle and shirting linens, drills, ducks, furniture coverings, creas, platillas, silesias.

383 Brown & Son, John, 111 French Street, Glasgow. [See Advt.

Madras and Crete muslins, figured and plain book muslins, frilled muslin curtains.

384 Brown & Sons, John S., 12 Bedford Street, Belfast, and 116 Franklin Street, New York. [See Advt.

Table and household linens, sheetings, huckabacks, towels, handkerchiefs. (See also Complimentary List, page xxxiii.)

385 Crippin, William, & Young, George, 48 Faulkner Street, Manchester.

Cotton and wool yarn in the dyed and manufactured state.

386 Fenton, Connor & Co., Linen Hall, Belfast.

Shirtings, sheetings, damasks, towellings, handkerchiefs, huckabacks, dowlas, crashes, canvases, and other linens, bleached and unbleached.

387 Ferguson Brothers, Holme Head Works, Carlisle; 39 Aldermanbury, London, E.C.; and 22 Princess Street, Manchester.

Speciality tailors' and dressmakers' cotton linings, viz., dyed silesias and pocketings, dyed and printed sateens, silk striped sateens, perculines, dress sateens; fine shirtings, and other goods.

388 Finlayson, Bousfield & Co., Flax Mills, Johnstone, Scotland, and North Grafton, Mass. Selling Agents, J. R. Leeson & Co., Boston. [See Advt.

Linen threads of every description made from flax for machine and hand sewing, welt, sole and lockstitch threads of all kinds for the boot and shoe trade; saddlers', bookbinders', and carpet threads; linen, crochet and lace threads; rope floss, burganen, and flourishing threads of the most delicate shades for embroidery and art needlework; salmon net and gilling twines.

389 Fox & Son, Charles, Leeds, Yorkshire, and 15 Old Change, London, E.C.

Sheetings, damasks, towelling, huckabacks, glass cloths, and other linen goods.

390 King & Son, John, 38 West George Street, Glasgow. [See Advt.
Scotch window hollands.

391 Liddell & Co., William, Upper Queen Street, Belfast; 6 Milk Buildings, London, E.C.; 18 White Street, New York. [See Advt.

Linen damasks, table cloths and napkins, towels, sheetings, pillow and shirting linens.

392 Matier & Co., Henry, Belfast, Ireland; and New York. [See Advt.

Linen and cambric handkerchiefs, linen damask and napkins, white linens.

393 Old Bleach Linen Co. (The), Randalstown, Co. Antrim, Ireland.

Bordered towels with hemstitched ends, damasks, diapers, embroidery, household and other linens.

394 Richardson, Sons, & Owden, Limited, J. N., Donegall Square North, Belfast; and 84, Franklin Street, New York.
[See Advt.

Linen damask cloths and napkins, damask doylies, fronting linen and shirting linen, pillow linens, sheetings, pillow cases and pillow shams, sheets, handkerchiefs, plain and embroidered; glass cloths, towellings, huckabacks, and dyed linens.

395 Robertson, Ledlie, Ferguson & Co., Limited, The Bank Buildings, Belfast.

Royal table damask.

396 Swainson, Birley & Co., Fishwick Mills, Preston; 7 Charlotte Street, Manchester; 5 Goldsmith Street, Wood Street, London; 21 Hope Street, Glasgow. [See Advt.

Long cloths, plain and fancy cotton dress goods, sheetings.

397 Turnbull & Stockdale, Irwell Print Works, Stacksteads, near Manchester; 21 York Street, Manchester; and 231 Oxford Street, London.

Machine and hand printed cretonnes and velveteens, designed by Lewis F. Day.

See laces, GROUP CVI.

Ardeshir & Byramji. *See* Indian Exhibits.

Bartrum, Harvey & Co. *See* GROUP CIII.

Belfast Ropework Co., Limited. *See* GROUP LXXXV.

Bhumgara & Co., F. P. *See* Indian Exhibits.

Cash, J. & J. *See* GROUP CVI.

Combe, Barbour, & Combe, Limited. *See* GROUP IX.

Houssein, M. D. *See* Indian Exhibits.

Irish Industries Association. *See* GROUP CIV.

Lewis & Sons, William. *See* GROUP CIV.

Shaw & Co., Jhoomuck. *See* Indian Exhibits.

Shaw, Chedee Lall. *See* Indian Exhibits.

Shaw, M. L. *See* Indian Exhibits.

Marwanjee & Co., P. *See* Indian Exhibits.

Tellery & Co., S. J. *See* Indian Exhibits.

GROUP CIII.

WOVEN AND FELTED GOODS OF WOOL AND MIXTURES OF WOOL.

398 Apperly, Curtis & Co., Dudbridge Mills, Stroud, Gloucestershire.
[*See* Advt.

Woollen and worsted coatings, superfine cloths and doeskins, altonas, Venetians, cassimeres, waterproofed covert coatings, Meltons and beavers, cheviots and serges, fancy suitings, woollen and worsted trouserings, tweeds, tennis and cricket cloths, hygienic cloths, tropical cloths, and novelties for evening dress.

399 Athlone Woollen Mills Co., Shannon and Burnbrook Mills, Athlone, Ireland.

Irish cheviot tweeds, friezes, serges, homespuns, dress materials and novelties.

400 Bartrum, Harvey & Co., Gresham Street, London, E.C.

Worsted and woollen cloths, beaver finished Italians and mohairs; cotton and linen goods; silks and vestings.

401 Bontor & Co., Thomas, 35 and 36 Old Bond Street, London, W.
Carpets; parqueterie.

402 Cameron-Maclachlan, Dugald, Oban, Argyllshire, Scotland.
Clan tartans.

403 Carr & Co., Isaac, Twerton Mills, Bath.
Woollen and worsted cloths.

404 Dormeuil Frères, 10 New Burlington Street, London, W.
Woollens and linings for men's wear. [See Advt.]

406 Fison & Co., William, Greenholme Mills, Burley-in-Wharfedale, Yorkshire.

All-wool serges, waterproof and dress goods, light coatings, cheviots, imitation Indian chudder shawls.

407 Hooper & Co., Charles, Eastington Mills, Stonehouse, Gloucestershire.

West of England fine cloths:—coatings, trouserings, serges, military (scarlet), naval (blue), carriage, livery, cricket and tennis, billiard, piano, printers', gloving cloths. Speciality: Hooper's "warpless elastic cloths."

408 Irish Woollen Manufacturing and Export Co., Limited,
2, 3 Usher's Quay, Dublin; 40 Union Street, Glasgow; New York.
Woollen goods; ready made clothing of Irish woollens.

409 Macnaughton, A. and J., Pitlochry, Perthshire, Scotland.

Scotch tweeds and homespuns for ladies' gowns, jackets, cloaks, wraps, and for gentlemen's suits, capes and highland cloaks; plaids, rugs, and shawls, solid and reversible in cheviot, Saxony, and vicuna.

410 Marling & Co., Limited, Stroud, Gloucestershire.
West of England plain and fancy woollens and worsteds.

411 Neilson, Shaw & Macgregor, Prince of Wales Buildings, 44 Buchanan Street, Glasgow, Scotland.

Scottish clan tartan fabrics, in fine Saxony wool for ladies, heavy Saxony and cheviot makes for gentlemen's Highland suits; tartan silks and velvets; Scotch tweeds, woollen and silk shawls, travelling plaids, mauds and rugs; curtains, carpets, hearthrugs; tartan hose, scarfs, sashes, neckerchiefs, ribbons; Scottish jewellery and Highland ornaments.

412 Pocock & Co., T. P., Waterford Mills, Chippenham, Wiltshire.
Worsted coatings, in special fine qualities for dress suitings

- 413 Priestley & Co., B.**, *Albion Works, Laister Dyke, Dole Mills, Thornton and Springfield Mills, Idle, Yorkshire. New York representatives: W. G. Hitchcock & Co., 453, Broome Street.*
Silk and wool, and all-wool dress fabrics, veils, veilings, shawls, cloakings.
- 415 Smith & Son, Turberville** (*Industrial Partnership*), 9 *Great Marlborough Street, London, W.*
Hand-made Axminster carpets.
- 416 Stephen, A. & F.**, *Bogie Bridge Mills, Huntly, Aberdeenshire.*
Cheviot wool, Scotch and Harris homespun tweeds, ladies' costume tweeds, clan tartans, ladies' and gentlemen's travelling rugs, mauds, and Scotch plaids.
- 417 Thomson & Sons, Limited, William** (*Industrial Partnership*), *Woodhouse Mills, Huddersfield.*
Woollen and worsted cloths, black, indigo and fancy.
- 418 Ward & Taylor, Bradford-on-Avon, Wilts.** [See Advt.
West of England tweeds, fancy trouserings and suitings, covert coatings and riding tweeds, whipcords, buckskins and Bedford cords.
- 419 Yates & Co., Limited, Royal Carpet Factory, Wilton, Wilts.**
Hand-woven real Axminster carpets.

Ardeshir & Byramji. See Indian Exhibits.

Cleghorn, Jun., William. See GROUP LXXXIX.

Houssein, M. D. See Indian Exhibits.

Irish Industries Association. See GROUP CIV.

Marwanjee & Co., P. See Indian Exhibits

Muddiman, T. & J. See GROUP CVI.

Peat & Co., Henry. See GROUP LXXXIII.

Tellery & Co., S. J. See Indian Exhibits.

GROUP CIV.

CLOTHING AND COSTUMES.

- 421 Cartwright & Warners, Limited, Loughborough.** [See Advt.
Gentlemen's underwear, in shirts, trousers, hose and half-hose; ladies' and children's undervests, drawers, pantalettes, combination dresses, hose and socks, in white, merino, natural wool, cashmere, and silk and wool.
- 422 Cooksey & Co.,** *Factory: 15 Bennett Street, Stamford Street, London, S.E. Retail Establishments: 5 Bishopsgate Street (opposite Cornhill), 93 Great Tower Street (3 doors from Mincing Lane), and 57 Cheapside, London, E.C.* [See Advt.
Silk, felt, pull-over and opera hats, and terrai hats for hot climates.
- 423 Holden Brothers, 223½ Regent Street, London, W.**
"Natureform" children's boots and shoes.
- 424 Hummel & Co., E. & H., 6 Old Bond Street, London, W.**
Shirts, hosiery and underclothing.
- 425 Irish Industries Association, Dublin and London.**
Irish hosiery and woollen goods, underclothing, linens, Irish laces and crochet, silk and linen embroideries, drawn and cut linen work.
- 426 Lincoln, Bennett & Co., 1, 2 and 3 Sackville Street, and 40 Piccadilly, London, W. Manufactory and shipping department: 23, 24 and 25 Nelson Square, and 19-20 Charlotte Street, Blackfriars Road, London, S.E.** [See Advt.
Silk velvet napped hats, felt, soft and stiff pull-overs in variety, ladies' silk velvet napped and felt riding hats; naval and military helmets.
- 427 Lewis & Sons, William, 13 Cheapside, London, E.C.** [See Advt.
Underwear and hosiery (ladies' and gentlemen's), accessories to gentlemen's dress (gloves, cravats, shirts, collars, pyjamas); specimens of antique English silk hosiery, including stockings made for King George IV.

- 428 Lobb, John, 296 *Regent Street, W.*, and 29 *St. James Street, S.W.*,
London.
Boots and shoes (ladies' and gentlemen's).
- 429 Macqueen & Co., 8, 9 *Barbican*, and 14 *Long Lane, London, E.C.*
and *Bredbury, Stockport*, and *Denton*. [See Advt.
Felt and silk hats and helmets (civilian and official).
- 430 Martin & Co., F. J., (*Warehouse*) 14 *Monkwell Street, City*, and
(*factory*) *Appold Street, Finsbury, London, E.C.*
Gloves, patent glove and boot clasps in bulk, and attached to
articles.
- 431 Morley & Gray, W., 36 *Gutter Lane, London, E.C.*
Patent fashioned knee and garterless hose.
- 432 Ormes, Upsdale & Co., 4 *Falcon Avenue, London, E.C.*
[See Advt.
English Milanese silk gloves, with patent trebly woven tipped
fingers, English Milanese silk mitts and gauntlets, English
Milanese silk material, silk lace gloves and mitts.
- 433 Reily, Kate, 11, 12 *Dover Street, Piccadilly, London*.
Ladies' costumes and court trains.
- 434 Shingleton, William, 60 *New Bond Street, London, W.*
Patent safety riding habit. [See Advt.
- 435 Smyth & Co., Limited, *Factory: Balbriggan, Ireland; Ware-*
rooms: 37 Lower Abbey Street, Dublin, and 3 and 4 *Milk Street,*
London.
Real Balbriggan hosiery.
- 436 Walker & Sons, R., *Rutland Street, Leicester*.
Woollen underclothing and hosiery.

Anderson, Anderson & Anderson. See GROUP CIX.

Grant & Co., W. H. See GROUP C.

Irish Woollen Manufacturing and Export Co., Limited.
See GROUP CIV.

Neilson, Shaw & Macgregor. See GROUP CIII.

GROUP CVI.

LACES, EMBROIDERIES, TRIMMINGS, ARTIFICIAL FLOWERS, FANS, &c.

437 Benton & Johnson, 63 *King's Cross Road, London, W.C.*

Gold and silver laces, embroidering materials, and all descriptions of tinsel threads.

438 Harper, Thomas, *Phœnix Works, Redditch, Worcestershire.*

Needles and fancy needle cases, steel toilet pins; surgeons' needles of every description.

439 Cash, J. & J., *Coventry, Warwickshire; and 92 Green Street, New York.* [See Advt.]

White and coloured frillings, insertions and embroideries woven names and initial letters for marking household linen patent friction bath towels and gloves.

440 Laird, G. & S. (Misses), *Paris House, 58 Grafton Street, Dublin.*

Irish lace and feather fans mounted in ivory, tortoiseshell, and bog oak; Connemara and bog oak jewellery.

441 Milward & Sons, Limited, Henry, *Washford Mills, Redditch, Worcestershire.*

Needles; fish hooks and fishing tackle.

442 Muddiman, T. H. & J., 18 *Victoria Park Square, London, E.*

Mantle and costume trimmings.

443 National Lace Co., 54a *High Pavement, and Commerce Square, Nottingham.*

Specialities in silk and cotton laces and lace curtains.

444 Peach & Sons, Samuel, *Lister Gate, Nottingham.*

Nottingham lace curtains.

445 Turner & Sons, R., *Old Factory, Redditch, Worcestershire.*

All kinds of pins, needles and hair-pins; needlecases in great variety; G. Chambers & Co.'s patent needles and fish hooks.

Ardeshir & Byramji. See Indian Exhibits.

Barbour & Sons, Limited, Wm. See GROUP CII.

- Bhumgara & Co., F. P. *See* Indian Exhibits.
 Collinson & Lock. *See* GROUP C.
 Das & Gopinath, Bhugwan. *See* Indian Exhibits.
 Fry & Co. *See* GROUP C.
 Grant & Co., W. H. *See* GROUP C.
 Irish Industries Association. *See* GROUP CIV.
 Lall & Son, Ganeshi. *See* Indian Exhibits.
 Martin & Co., F. J. *See* GROUP CIV.
 Marwanjee & Co., P. *See* Indian Exhibits.
 Tellery & Co., S. J. *See* Indian Exhibits.

GROUP CVII.

HAIR WORK, COIFFURES, AND ACCESSORIES OF THE TOILET.

- 446 Foote & Son, J., 62 & 63 *New Bond Street, London.*
 Toilet accessories.
- 447 Hindes, Limited, *Metropolitan Works, Birmingham; and 1*
Tabernacle Street, London, E.C. [See Advt.
 Brushes and toilet requisites.
- 448 Stewart & Co., S. R., *Aberdeen Comb Works, Aberdeen.*
 [See Advt.
 Combs—imitation tortoiseshell, buffalo, rhinoceros, and pure
 white horn—drinking cups, shoe horns, paper cutters, and every
 description of horn goods and ornaments.
- Turner & Sons, R. *See* GROUP CVI.
 Staniforth, Wm. Thos. *See* GROUP CXIX.
 Wostenholm & Son, Limited, George. *See* GROUP CXIX.

GROUP CVIII.

TRAVELLING EQUIPMENTS, VALISES, TRUNKS, TOILET CASES, FANCY
 LEATHER WORK, CANES, UMBRELLAS, PARASOLS, &c.

- 449 Bryant, Robert, 24 *Drury Lane, London, W.C.*
 Wood and leather gun and pistol cases, cartridge magazines
 and carriers, bags and belts, holsters, pouches, gun covers and
 game bags, and all kinds of sporting accoutrements; and leather
 goods.

- 450 White & Son, William, 15 *Gibson Street, Glasgow.*
Clay tobacco pipes.

Burroughs, Wellcome & Co. *See* GROUP LXXXVII.

Goldsmiths' & Silversmiths' Co. *See* GROUP XCVII.

Mappin Brothers. *See* GROUP XCVII.

Noble, Brown & Co. *See* GROUP LXX.

Swaine & Adeney. *See* GROUP LXXXIII.

Ward & Co., Limited, Marcus. *See* GROUP LXXXIX.

GROUP CIX.

RUBBER GOODS, CAOUTCHOUC, GUTTA-PERCHA, CELLULOID AND ZYLONITE.

- 451 Anderson, Anderson, & Anderson, 37, *Queen Victoria Street, E.C.; and (works) Bow, E., London.* [See Advt.

Specialities in ladies' and gentlemen's pure rubber odourless waterproofs for fishing, shooting, yachting, driving and general use; "Chicago" ocean travel waterproof; new Army regulation infantry and cavalry waterproof (sealed pattern); new Admiralty regulation waterproof (sealed pattern).

- 452 Cravenette Company, Limited (The), 21 *Booth Street, Bradford, Yorkshire.*

Porous waterproof cloths.

- 453 Zacharias & Co., J., 26 and 27 *Corn Market Street, Oxford.*
Waterproof garments.

See medical and surgical instruments, GROUP CXLVIII.

Ash & Sons, Limited, Claudius. *See* GROUP CXLVIII.

Byers & Co., Joseph J. *See* GROUP LXXIV.

Gasking Patent Belt Co. *See* GROUP LXIX.

Noble, Brown & Co. *See* GROUP LXX.

GROUP CX.

TOYS AND FANCY ARTICLES.

Ardeshir & Byramji. *See* Indian Exhibits.

Bhumgara & Co., H. P. *See* Indian Exhibits.

- Harper, Thomas. *See* GROUP CVI.
 Hitching & Wynn. *See* GROUP LXXXIII.
 Houssein, M. D. *See* Indian Exhibits.
 Rau Proyag. *See* Indian Exhibits.
 Stewart & Co., S. R. *See* GROUP CVII.
 Tellery & Co., S. J. *See* Indian Exhibits.
 Tuck & Sons, Raphael. *See* GROUP CL.
 Turner & Sons, R. *See* GROUP CVI.

GROUP CXI.

LEATHER AND MANUFACTURES OF LEATHER.

- See* harness and saddlery, &c., GROUP LXXXIII.
 Bryant, Robert. *See* GROUP CVIII.
 Gasking Patent Driving Belt Co. *See* GROUP LXIX.
 Jeffrey & Co. *See* GROUP LXXXIX.
 Lobb, John. *See* GROUP CIV.
 Woollams & Co., Wm. *See* GROUP LXXXIX.

GROUP CXII.

SCALES, WEIGHTS, AND MEASURES.

- See also* GROUPS LXVI. and CLI.
 Macfarlane, Strang & Co., Limited. *See* GROUP LXIX.
 Swaine & Adeney. *See* GROUP LXXXIII.

GROUP CXIII.

MATERIAL OF WAR—ORDNANCE AND AMMUNITION, WEAPONS AND APPARATUS OF HUNTING, TRAPPING, &c., MILITARY AND SPORTING SMALL ARMS.

- 454 Curtis's & Harvey, Office, 74 Lombard Street, London, E.C.;
 Works, Hounslow and Tunbridge, England; Glyn Neath, Wales;
 Kyles of Bute, Scotland.

Dummy samples of gunpowder for military, naval, sporting, and blasting purposes; various ingredients used in manufacture of the same.

455 Eley Brothers, Limited, 254 Gray's Inn Road, London, W.C.
Sporting and military ammunition.

456 Greener, W. W., St. Mary's Square, Birmingham; and 68 Haymarket, London, S.W.
Sporting guns.

457 Joyce & Co., Limited, F., 57 Upper Thames Street, London, E.C.
All kinds of ammunition for light arms.

458 Lancaster, Charles, 151 New Bond Street, and (manufactory) 2 Little Bruton Street, Bond Street, London, W.
Sporting hammer, hammerless, and ejector guns, for game, pigeon, and duck shooting, sporting rifles, military pistols.

459 Scott & Son, W. and C., Premier Gun Works, Birmingham.
[See Advt.]
Sporting hammer, hammerless, and ejector breech-loading guns.

See salt and freshwater fishing, GROUPS XXXVIII. and XXXIX.

See warlike appliances, GROUP LXXXVI.

Staniforth, W. T. *See GROUP CXIX.*

Wostenholm & Son, Limited, George. *See GROUP CXIX.*

GROUP CXIV.

LIGHTING APPARATUS AND APPLIANCES.

460 Clarke's Pyramid and Fairy Light Co., Limited, Cricklewood, London, N.W. [See Advt.]

“Pyramid” nursery lamp, food-warmers, invalid lamps,
“pyramid” and “fairy” candles for burning in same.

See also electric lighting, GROUP CXXIX.

Moore Brothers. *See GROUP XCI.*

Worcester Royal Porcelain Co., Limited. *See GROUP XCI.*

GROUP CXV.

HEATING AND COOKING APPARATUS AND APPLIANCES.

461 Barnes' Patent Dryer and Airer Syndicate (The), 5 Clerkenwell Road, London, E.C.

Clothes dryers and airers for domestic and other uses.

- 462 Ewart & Son, 346-350 *Euston Road, London.* [Mach. B.]
[See Advt.]

Bath and geyser; the "Lightning Geyser," an apparatus for instantaneously heating water; the water is heated to any required temperature as it flows through the geyser, directly the gas is lighted, and by means of a safety valve the gas is turned down whenever from any cause the water ceases to flow; the "Ewart" gas controller for preventing waste from over-pressure.

- 463 Steel & Garland, *Wharncliffe Works, Sheffield*; 9 *Cork Street, Bond Street, W.*, and 18 *Charterhouse Street, Holborn Circus, E.C., London.* [See Advt.]

Grates, fenders, curbs, and fire-side requisites; wood chimney-pieces and over-mantels. (See also Complimentary List, p. xxxvi.)

- 464 Wright & Co., Limited, *John, Essex Works, Aston, Birmingham*; and 105 *Cheapside, London.* [Mach. B.]

Gas cooking and heating apparatus, gas fires, gas baths.

See electric heating, GROUP CXXX.

Baker & Sons, Joseph. See GROUP LXXIX.

Beckmann & Co. See GROUP XLV.

Caddy & Co., Limited. See GROUP LXIX.

Day & Martin. See GROUP LXXXVIII.

Economic Smokeless Fire Co. See GROUP LXIX.

Hodgkinson & Co., Limited. See GROUP LXIX.

Main, Thomas. See GROUP XXVI.

Nixey, W. G. See GROUP XLVI.

GROUP CXVI.

REFRIGERATORS, HOLLOW METAL WARE, TIN PLATE, ENAMELLED WARE.

Baker & Sons, Joseph. See GROUP LXXIX.

Idris & Co. See GROUP X.

Smith & Sons, T. See GROUP XCIX.

GROUP CXIX.

VAULTS, SAFES, HARDWARE, EDGE TOOLS, CUTLERY.

- 465 Foster & Son, A., 108 *Rockingham Street, Sheffield.* [Mach. B.]

Hand-made steel tools for chasers, repoussé workers, and die-sinkers.

466 Staniforth, Wm. Thos., *Ascend Cutlery Works, Sheffield.*

Pocket cutlery, bowie, hunting and farmers' knives.

467 Tubular Lock Syndicate, Limited (The), *Leadenhall Buildings, London, E.C.*

Patent tubular reversible mortise locks.

468 Wostenholm and Son, Limited, George, *Washington Works, Sheffield.*

Pen, pocket and sporting knives, table cutlery, razors, scissors.

See ships' hardware, GROUP LXXXV.

Beckmann & Co. *See GROUP XLV.*

Goldsmiths' and Silversmiths' Co. *See GROUP XCVII.*

Mappin Brothers. *See GROUP XCVII.*

Wright & Sons, Peter. *See GROUP LXXI.*

GROUP CXX.

PLUMBING AND SANITARY MATERIALS.

See hygiene and sanitation, GROUP CXLVII.

Albion Clay Company, Limited. *See GROUP XLVI.*

Ewart & Son. *See GROUP CXV.*

Farnley Iron Company, Limited. *See GROUP XLVI.*

Knowles, Henry. *See GROUP LXXVIII.*

Macfarlane, Strang & Co., Limited. *See GROUP LXIX.*

Wright & Co., Limited, John. *See GROUP CXV.*

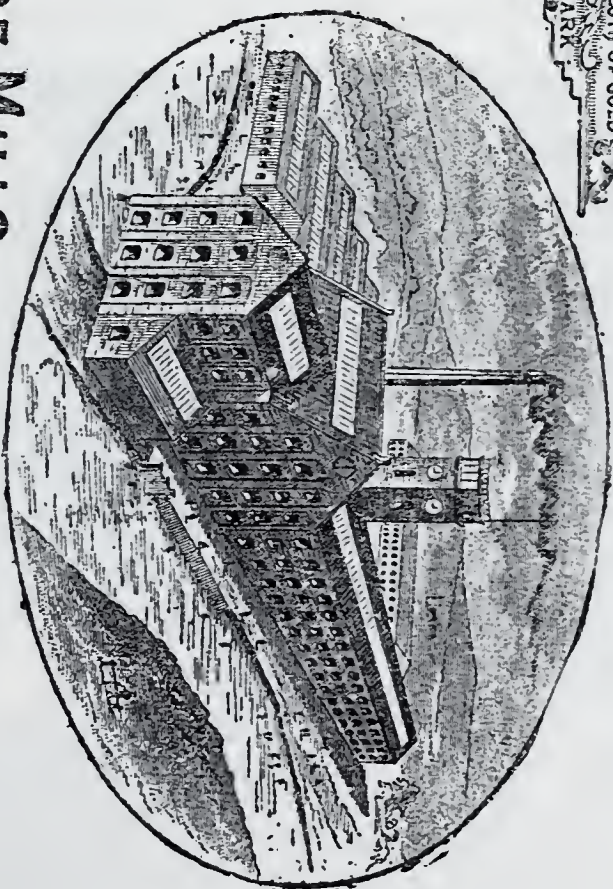
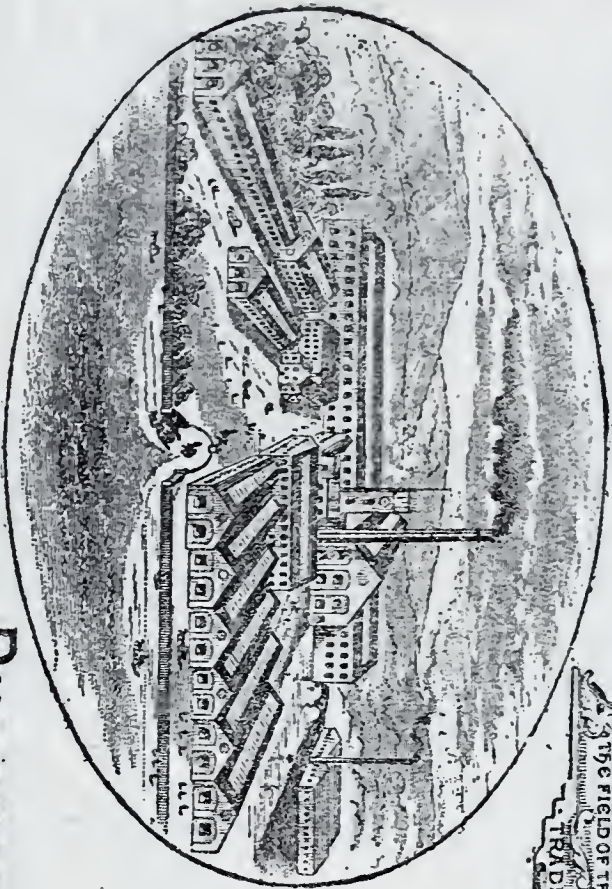
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TELEGRAPHIC & CABLE ADDRESS,
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DEPARTMENT H
GROUP 103
EXHIBIT 91 H.

MANUFACTURERS OF

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WATERPROOFED COVERT COATINGS. MELTONS & BEAVERS. VICUNAS & LLAMAS. CHEVIOTS & SERGES. FANCY
SUITINGS. WOOLLEN & WORSTED TROUSERINGS. TWEEDS. TENNIS & CRICKET CLOTHS. HYGIENIC CLOTHS. TROPICAL
CLOTHS & NOVELTIES FOR EVENING DRESS.

15 GOLD MEDALS 1851 TO 1891.

FOR EXCELLENCY OF MANUFACTURE.

EPSTEIN ACCUMULATORS

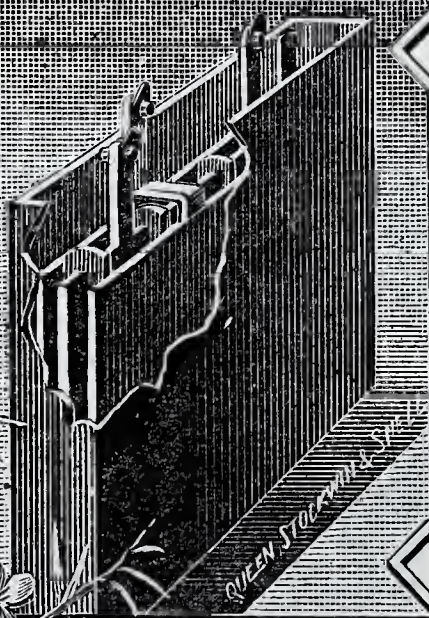
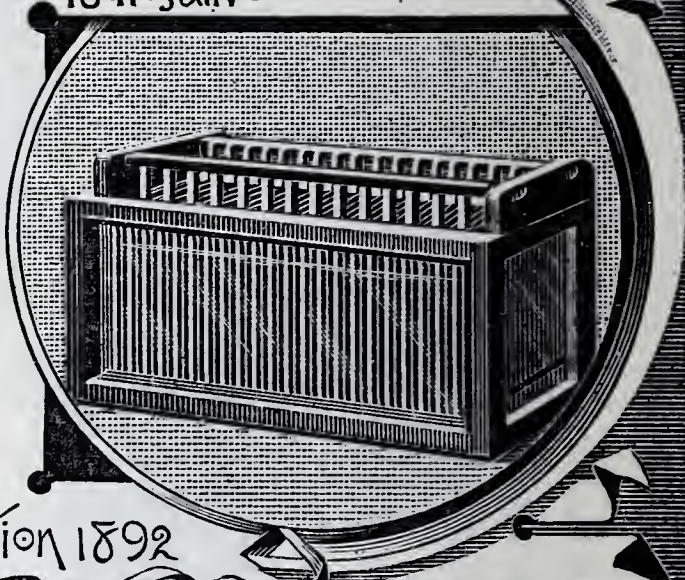
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Durable,
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No Paste
used,
Large
capacity,
High
discharge.

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After standing in the acid idle & completely exhausted for over 5 months this cell was discharged at 1,000 amperes for 1 hour 22½ minutes by the Jury of the Crystal Palace electrical exhibition 1892

R-31 CELL
15 Positive
16 Negative Electrodes



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ELECTRICITY AND ELECTRICAL APPLIANCES.

By W. E. AYRTON, F.R.S.,

Professor of Applied Physics, City and Guilds of London Central Institution.

Submarine telegraphy was born in Great Britain, and for many years past this country has been the centre of the cable manufacturing industry. The commercial development of land telegraphy dates from the erection of a little wire in the north-west of London; and to-day the land lines of Great Britain can hold their own in comparison with those of any other country, both as regards the rapidity of signalling and the number of messages dealt with per unit of the population. The application of electricity to the distribution of time and to railway signalling has not been neglected in this country; while Birmingham and Sheffield have acquired a world-wide reputation for their electro-plate. But in the adoption of electricity for industrial purposes which require the use of large currents Great Britain has been very backward. This has arisen partly from the vast squandering of money in rash electric light speculations that went on twelve years ago, and which put a temporary stop to electrical development, and partly from the onerous restrictions that were introduced by the passing of the ill-considered "Electric Lighting Act of 1882." The fear, however, which filled the minds of our legislators that the electric lighting of our streets and houses would breed a monster as tyrannical as our water companies was gradually dispelled, and a new impetus was given to the electrical industry by

the passing of the revised "Electric Lighting Act of 1888." Since that date electric lighting has made steady progress in this country; indeed, during the last two years it has been advancing with those leaps and bounds which characterise British conservative radicalism.

Apart from the princely fortune that was frittered away on imaginary electric lighting projects, the capital that up to the present time has been expended in providing for the supply of electric light in Great Britain is £4,363,695, and of this £1,307,797 was expended in 1892. To this sum must be added £529,293, which has been already sanctioned by local authorities for work in course of erection, but the loans for all of which have not yet been raised; and a further expenditure of £250,000 which is projected by the local authorities of ten other towns for the electric lighting which will probably be started within the next few months, as the tenders are already under consideration. Before the end of 1893, then, five millions sterling will have been spent in providing for the supply of electric current from public mains in this country, exclusive of the sums spent in wiring and fitting up the buildings in which the light is used.

Up to the present time the greater part of the work has been carried out by public companies, but popular opinion is now tending towards the supply of the electric energy by the local authorities; and of the twenty-five new towns in which the electric supply was undertaken last year, in seventeen it was carried out by the local authorities, leaving only eight to be dealt with by public companies. This change appears to have been brought about partly by the growing spirit of municipalism in English towns; partly by a still lingering dread of a public company obtaining a monopoly, and partly by the more favourable rate at which local authorities can raise capital.

Of the total number of electric lights run from central stations in Great Britain about five-sixths are in London, where, at the end of 1892, there were about 526,000 eight-candle lamps, or their equivalent, connected with the public mains, some 330,000 of which were added during the past two years. To supply current for these

526,000 lamps there are nineteen generating stations, having a total plant capacity of about 839,000 eight-candle lamps, or about 40,000 horse-power.

Seven different systems are employed in London for distributing the electric energy, and the approximate number of lamps supplied with current on each system is shown in the following table :—

ELECTRIC LIGHTING IN LONDON AT THE END OF 1892.

System of Distribution.	Number of Generating Stations.	Number of 8-candle power Lamps connected.	Plant Capacity in 8-candle power Lamps.	Distance of farthest Lamp in yards.	P. D. at Generating Station in volts.
LOW PRESSURE.					
2-wire with batteries	1	10,000	20,000	780	102
3-wire	3	74,000	115,000	1,090	210
3-wire with batteries	6	166,000	287,000	1,820	{ 201 to 230
HIGH PRESSURE.					
Continuous current with batteries or motor dynamos	2	40,000	70,000	1,600	1,250
Continuous current arc lamps for street lighting	3	{ 516 arcs, equivalent to about 7,500 }	{ 890 arcs, equivalent to about 12,500 }	3,344	570 to 2,600
Alternate current with transformers in the houses	6	156,000	210,000	2,500	{ 1,000 to 2,000
Alternate current with transformers in sub-stations	1	73,000	125,000	9½ miles	{ 2,200 to 10,000

Hence we see that of the 526,000 eight-candle lamps, or their equivalent, which are connected with the London public mains, 297,000 are supplied with energy by means of continuous current, and 229,000 by means of alternating current,

The following table gives briefly the approximate condition of the public electric lighting of the provinces at the end of 1892, and, as in the preceding table, the numbers given are rather under than over the truth :—

ELECTRIC LIGHTING IN THE PROVINCES AT THE END OF 1892.

System of Distribution.	Number of Generating Stations.	Number of 8-candle power Lamps connected.	Plant Capacity in 8-candle power Lamps.	Distance of farthest Lamp in yards.	P. D. at Generating Station in volts.
LOW PRESSURE.					
2-wire	4	10,200	21,500	1,760	107
2-wire with batteries .	9	72,000	90,000	1,700	{ 105 to 125
3-wire	2	17,000	32,000	1,000	
3-wire with batteries .	2	6,500	11,700	900	{ 230 to 210
HIGH PRESSURE.					
Continuous current with motor dynamos }	2	7,000	18,000	2,550	1,000
Continuous current arc lamps for street lighting . . . }	11	{ 348 arcs, equivalent to about 4,700 }	{ 512 arcs, equivalent to about 7,200 }	—	—
Alternate current with transformers . . }	33	89,570	140,700	5,000	2,000

In addition, the following stations in the provinces are almost ready to start :—

	Number of Generating Stations.	Plant capacity in 8-candle power Lamps.	P. D. at Generating Station in volts.
2-wire with batteries	1	2,500	105
High pressure alternate current with transformers .	4	47,000	2,000

So that, if we assume that the same proportion of lamps will be connected as in the other provincial examples of the same systems, we may say that the total number of eight-candle power lamps connected, or on the point of being connected, with the provincial

mains is about 240,000, of which about half are supplied with direct current, and half with alternating current. For the whole of Great Britain, including London, there are, then, about 417,000 eight-candle lamps, or their equivalent, supplied with continuous current and about 349,000 supplied with alternating current from public mains, making a total altogether of over three-quarters of a million eight-candle power lamps, or their equivalent, supplied with current from central stations.

In the residential districts of London it is found that the maximum number of lamps turned on at one time is only about 30 per cent. of the total number connected with the mains; where there are shops, clubs, or theatres, this percentage is increased to 55 or 60, and in the city itself it reaches as much as 70, the average for the whole metropolis being about 40 per cent. In private houses each lamp is, on the average, turned on for only one hour in the twenty-four, in residential flats and shops for one hour and a half, and in clubs for four hours.

The price for the amount of electric energy corresponding with 1000 watts for one hour, one kilowatt hour, or one Board of Trade unit, as it is called, varies when used to produce light from 4*d.* in Newcastle to 10*d.* in Eastbourne. In London itself it varies from 5*d.* to 8*d.*; and, as this amount of energy will keep a nominal eight-candle lamp glowing for about thirty hours, and, as the average light given out by such a lamp during its life may be taken as about six candles, one Board of Trade unit produces about 200 candle hours. Hence, at $6\frac{1}{4}$ *d.* per unit, an illumination of eight candles for eight hours can be obtained for about eight farthings.

The actual cost of producing a kilowatt hour, inclusive of coal, water, oil, stores, wages, and salaries in the generating station, has, in the case of the St. James's and Pall Mall Company, been reduced to $1\frac{4}{5}$ *d.* The sum debited to management, law charges, depreciation and redemption fund comes also to $1\frac{4}{5}$ *d.* per kilowatt hour, while repairs, rent, rates, and taxes add $\frac{3}{5}$ *d.* bringing the total cost per unit up to $4\frac{1}{4}$ *d.*

The public demand for the electric current in Great Britain is almost confined to its use for lighting. The Vestry of St. Pancras have, however, set the example of offering a supply during the day for motive purposes only at 3*d.* a unit; but even at this price the public supply is up to the present but little used to work motors.

A new departure has this week (February 18th, 1893) been made by the City of London Electric Lighting Company, who now offer electric power for heating and driving motors at 4*d.* per unit at any time day or night, and at the same price even for lighting from 8 p.m. to 8 a.m.

The characteristic feature of British electric light stations is the direct coupling of each dynamo to a high-speed engine, about 30,000 horse-power for electric lighting from central stations being generated by some 200 Willans' central valve single-acting engines, and about 20,000 horse-power is generated by engines of the same type for the private electric lighting of hotels, theatres, factories, &c., in this country. These engines when of 200 brake horse-power, working at about 160 lbs. steam pressure and condensing, are guaranteed to have 92 per cent. and 85·5 per cent. efficiency at full and half load, and to produce one brake horse-power with a consumption of 19 and 20 lbs. of steam in the two cases.

Great economy in space is obtained, and the absence of belts and ropes not only diminishes the trouble and expense of maintenance, but increases the joint efficiency of engine and dynamo, so that, allowing for all wastes in the engine, bearings, and in the dynamo itself, 84 per cent. of the power mechanically developed by the steam is given electrically to the street mains in the case of the large direct-coupled engines working at full load.

Parsons' steam turbines, first brought to general notice at the Inventions Exhibition in 1885, were for some time considered to be as uneconomical as they were interesting. They have, however, been so much improved that a 100 kilowatt turbine-dynamo working full load with super-heated steam at 103 lbs. pressure per square inch, can now generate one kilowatt hour with a consump

tion of 28·2 lbs. of steam, and thus is able to compete with good low-speed condensing engines.

Such a turbine-dynamo complete weighs but four tons, and occupies hardly 42 square feet of floor space. It stands on india-rubber blocks, requires no holding-down bolts, and runs almost without vibration. Two central stations, having a total plant capacity of 14,142 eight-candle lamps, have been fitted up with these turbines, and the price charged for a Board of Trade unit for lighting purposes is nowhere in Great Britain lower than at one of these stations, viz., that at Newcastle. Steam turbine alternators able to supply current for 21,428 eight-candle lamps, are now in course of construction for the lighting of a third English town, and it is expected that with the largest of these machines, which is to run at 4,800 revolutions per minute and develop 150 kilowatts, the consumption of steam per kilowatt hour at full load will not be more than about 22 lbs.

More attention has been given in this country than in any other to the design of dynamos and motors, with the result that continuous current two-pole machines of 200 to 300 kilowatts are now constructed to run at 350 revolutions with an electrical efficiency of 97·6 per cent. and a *commercial* efficiency, allowing for all losses in the dynamo, of 96 per cent. at full load; this latter being only reduced to 94·8 per cent. at half-load. Motors are now so well made that the average run of a locomotive on the City and South London Electric Railway before its motors require any repairs whatever is 10,000 miles; and sparking has been so completely annihilated that, although the copper gauze brushes are fixed permanently in one position, and therefore are not altered in lead, either for variations in speed, level or direction of motion of the locomotive, the same set of brushes have served for a 47,000 miles run of the locomotive.

Owing to the relative cheapness of large forgings and of heavy machine work, the type of dynamo most generally employed for British central stations is that with a single horse-shoe field magnet and a plain drum armature below. By ventilating the cores and using twisted or stranded copper bars, the total rise of temperature after a six hours' run at full load has been reduced to 50° F.

Electromotors have not been much used in connection with manufacturing operations in Great Britain, but it is beginning to be realised that in large factories the electric distribution of power from one powerful steam-engine is more economical than the employment of many small steam-engines in different parts of the works. And in one extensive factory near London, hitherto worked by fourteen separate steam-engines, arrangements are now completed for transmitting 1,200 horse-power *electrically* from a central steam-engine to work all kinds of machinery throughout the works.

The aggregate horse-power of all the dynamos and motors constructed in this country during the past three years appears to be about 100,000.

The fight between direct current at low pressure and alternate current at high pressure with transformers for town lighting is now raging in Great Britain; but, in spite of the fact that some users of alternate current have not succeeded in generating the Board of Trade unit for the price at which it is sold, one manufacturing firm alone in London has orders in hand for alternators to supply current for 900,000 eight-candle power lamps, and the western generating station of the City of London Electric Light Company will contain no less than sixteen 500 kilowatt alternators.

The self-excitation of alternators, so common abroad, is almost unknown in this country. The English practice is to join the field magnets of all the alternators in parallel, and excite them from one or more continuous current dynamos driven by separate engines.

Central stations supplying continuous current have hitherto been frequently fitted with accumulators, with the object, first, of dispensing with the running of the dynamos at night, thus saving one shift of men; and, secondly, by sending the current through the accumulators or the street mains, as the public demand varied, to keep the engines that were running at any time working at full load, and so developing their maximum efficiency. With the rapidly-increasing demand for current, however, from the London generating stations, all day and night running of the dynamos is becoming

necessary, and the number of dynamos at each station is becoming large enough to enable a skilful superintendent to select a particular combination of dynamos at each particular hour, day or night, so that the output is but little short of the maximum output that combination could furnish. Hence it is probable that the period is coming to an end when accumulators will be used in London generating stations for economical reasons, apart from the reserve of power they furnish in the very rare case of a breakdown of all the machinery.

It is important, however, to notice that with the modern accumulator, average energy efficiencies of 83·5 per cent. were obtained last year with accumulators in daily use at London central stations, although the cells were often called upon to discharge at considerably above their normal discharge rates.

For private country installations, where it would be very inconvenient to run the engine during the night, accumulators are much used; also at places where the dynamo is driven by a gas engine, accumulators supply a valuable means of steadying the light. The employment of storage cells for the propulsion of boats is rapidly increasing. There are already about 100 electric launches on the Thames, while on Lake Windermere and the Manchester Ship Canal a small fleet is in use. For these launches and for general purposes 2,200 cells were last year turned out by the English firm who construct pasted-plate-accumulators, and during the same period this firm also manufactured 14,000 cells for lighting purposes.

The development of tramcar traction by accumulators has been much hindered by the cost of renewal of the worn out plates. On the Birmingham Electric Tramway accumulators with *non-pasted* plates are now being tried, and, at a charge for maintenance of the cells at $1\frac{1}{2}$ d. per car mile, the makers of the accumulators are already reaping a profit.

While the supply of electric energy from central stations has been spreading in towns, the independent electric lighting of isolated houses has been extending in the country. This has given a great

impetus to the production of efficient gas, and still more recently of oil engines. The total cost, including repairs, interest, and depreciation, in a private installation with 50 sixteen-candle lamps, worked with an Otto engine burning ordinary coal-gas, comes to about 6*d.* per unit. Single Otto gas engines are now made developing 170 indicated horse-power, and when worked with Dowson gas, only four-fifths of a pound of anthracite coal is burnt to produce the gas consumed in the engine per indicated horse-power per hour.

An interesting and exact experiment has been carried out of comparing the former cost of lighting the London waxwork exhibition by ordinary coal gas with the cost during the last two years of employing the gas instead to drive a gas engine for electrically lighting the building. With gas at 2*s.* 9*d.* per 1,000 cubic feet, the cost of the gas per kilowatt hour developed has been 1 $\frac{1}{10}$ *d.*, and the total cost including, in addition, wages, water, interest and depreciation of, the generating plant and of accumulators, came to 3*d.* per kilowatt hour. Glow lamp renewals, arc light carbons, and interest on the cost of wiring and fitting up the building, amounted to not quite 1*d.* more per unit developed. The total cost per year of electrically lighting the building, including repairs, interest and depreciation, came to £1196 2*s.* 6*d.*, while gas lighting would have cost about £1370.

Already some 100 Priestman's oil engines are employed to supply power for separate electric light installations. The consumption of oil per brake horse-power is said to be about 1 lb., and the cost about one halfpenny.

Owing to the objections to poles and trolley wires in our streets electric traction has made but little headway in Great Britain, it having been almost entirely confined to the propulsion of cars along tracts not used or crossed by other vehicles. In addition to eleven more or less private track electric tramways in this country, there are two electric railways, the City and South London, opened at the end of 1890, and the Liverpool Overhead, opened at the commencement of this year, 1893. The former is three and a half miles long, and consists of two separate tubes each 10 ft. 2 in. inside diameter built up of cast iron. These tubes, which contain respectively the up and

the down lines, lie for the greater part of their length side by side at about 60 ft. below the street level, but where they go under the river Thames one tube is above the other, with a gradient in one place of one in fourteen. The weight of a normally loaded train, including the electric locomotive, is forty tons, the average speed between stations is thirteen and a half miles an hour, the maximum speed about twenty-three miles an hour and the total journey, including stoppages at four intermediate stations, is performed in fourteen minutes. There is at present a four minutes' service in each direction, but when the sidings at the Stockwell end of the line are completed the number of trains running will be increased to twelve, and the interval between two trains reduced to three minutes.

The first year of this railway's life was attended with constant breakdowns, as many as nine of the electric locomotives being on occasions under repair at one time. At first it was thought that the system of mounting the motor armatures directly on the axles of the driving wheels of the locomotive was responsible for the constant destruction of the armatures. However, without any radical change having been introduced into this method of driving, the life of an armature has been much lengthened by improving the electric arrangements; and during the second half of 1892 the working of the railway became so regular, that a distance of 214,417 miles was run by the trains in that period, and nearly three and a quarter million people carried. And the cost per train mile, including all repairs and renewals, and even such extras as salaries, office expenses, superintendence, etc., was reduced to 7·1*d*.

The Liverpool Overhead Electric Railway resembles a tramway in that there are no separate locomotives. Two long carriages holding 114 people form a train, and each carriage is supplied with a motor with its armature mounted directly on the axle. The length of the line is six miles, but as the maximum speed attained is from twenty-five to thirty miles an hour, the distance is run in less than thirty minutes, including stoppages at thirteen stations.

Submarine telegraphy is to-day carried on by means of 139,594 nautical miles of cable, and to keep these cables in repair 37 ships

are exclusively employed. Nearly the whole of these cables were manufactured in England, and to this country practically all these cable ships belong. 70,215,439 paid messages were transmitted last year by the British Government's land telegraph lines, while 3,400,000 words are daily sent by the Exchange Telegraph Company to the London clubs, newspaper offices, &c., where the messages are received in ordinary Roman character by tape-printers, working automatically at from 40 to 45 words a minute. In telephony the most recent advances are the telephone cable from London to Paris, which transmits speech with wonderful clearness, and the Government system of heavy copper-wire trunk mains, which is about to be erected, with a central exchange in Leeds. From this town the telephone lines will radiate, and then between Penzance and Aberdeen, or between Dover and Oban, conversation will not only become possible, but will be carried on with far greater ease than between one part of London and another at the present time.

DEPARTMENT J.

ELECTRICITY AND ELECTRICAL APPLIANCES.

Unless otherwise stated, the Exhibits in this Department are in the Electrical Building.

GROUP CXXIII.

APPARATUS FOR ELECTRICAL MEASUREMENTS.

General Electric Co., Limited. *See* GROUP CXXIX.

Lorrain, James. *See* GROUP CXXVIII.

GROUP CXXIV.

ELECTRIC BATTERIES, PRIMARY AND SECONDARY.

- 469 Epstein Electric Accumulator Co., Limited (The), 21a, Blythe Road, West Kensington, London, W. [See Advt.
Electric accumulators (secondary batteries).

GROUP CXXV.

MACHINES AND APPLIANCES FOR PRODUCING ELECTRICAL CURRENTS BY MECHANICAL POWER—DYNAMICAL ELECTRICITY.

- 470 Parsons & Co., C. A., Heaton Works, Newcastle-on-Tyne.

[See Advt.

Steam turbine alternator (condensing) for 150 kilowatt per hour output (not under steam), constructed for the utmost economy of steam and maintenance in the production of current from central station on the alternating or continuous current systems.

GROUP CXXVI.

TRANSMISSION AND REGULATION OF THE ELECTRICAL CURRENT.

- 471 Ewing, Robert, 19, Great George Street, Westminster, London.
The "Archer" patent-jointed conduits for underground electric cables.

General Electric Co., Limited. *See* GROUP CXXIX.

GROUP CXXVII.

ELECTRIC MOTORS.

Parsons & Co., C. A. See GROUP CXXV.

GROUP CXXVIII.

APPLICATION OF ELECTRIC MOTORS.

- 472 Lorrain, J. G., *Norfolk House, Norfolk Street, Strand, London.*
 Electric ventilators, fire extinguishers, air ships, clocks, meters, telephones, junction boxes, cable sleeves, telethermometers, regulators, carbons; application of electricity to oxidation, heating, sewage, purification, advertising, releasing animals, testing furnace gases, controlling fuel consumption, steam generation, mixing dyes, condensation, evaporation, desiccation, regulating the manufacture of water gas, aerated waters; filters, antiseptic material and process; gold extraction.

See electric roads, GROUP LXXXI.

London and North Western Railway Co. See GROUP LXXX.

GROUP CXXIX.

LIGHTING BY ELECTRICITY.

- 473 General Electric Co., Limited (The), 71 *Queen Victoria Street, London, E.C.; and Chapel Street, Manchester.*

Electric light fittings in various metals and glass, decorated chinaware for same, switchboards, switches, cut outs, arc and other lamps, carbons, resistances, ceiling roses, wall plugs, and other accessories for the regulation of the electrical current; meters and measuring instruments; Clarke's electrical gas lighter electric heaters; telephones.

Collinson & Lock. See GROUP XC.

GROUP CXXX.

HEATING BY ELECTRICITY.

General Electric Co., Limited. See GROUP CXXIX.

Lorrain, James. See GROUP CXXVIII.

GROUP CXXXI.

ELECTRO-METALLURGY AND ELECTRO-CHEMISTRY.

- 474 Ash, Gill & Company,** *Betchworth Works, Stratford Road, Birmingham.*

Specimens of electro-depositing and finishing by their patent process upon substances of a non-metallic nature.

- 475 London Metallurgical Co., Limited (The),** *80 Turnmill Street, London, E.C.*

Arcas silver plating.

See also plated ware, GROUP XCVII.

Higham, Joseph. *See* GROUP CLVIII.

GROUP CXXXIII.

ELECTRIC TELEGRAPH AND ELECTRIC SIGNALS.

- 476 Anders, & Kottgen, G. L.,** *10 Jeffrey's Square, London, E.C.*

Telephones and switches, time switches, phonographs; printing telegraphs, electric signals.

- 477 British Government,** *POSTAL TELEGRAPH DEPARTMENT, St. Martin's-le-Grand, London, E.C.*

Historical telegraphic apparatus dating from 1837, including the first specimen of underground work practically used; early five-needle and double-needle instruments; Cooke and Wheatstone's A B C telegraph; early forms of Wheatstone's automatic telegraph, Bain's first chemical telegraph. Modern telegraphic apparatus, as used at the present day by the British Postal Telegraph Department; single needle, A B C, sounders, and Bright's bell, or double-plate sounder; British type of Delany and quadruplex apparatus; fast-speed repeaters; pneumatic tube signalling instruments; telephonic switchboards and apparatus.

- 478 Phonopore Company, Limited (The),** *Faraday House, Charing Cross Road, London, W.C.*

Phonopore telegraph apparatus.

See railway signals, GROUP LXXX.

General Electric Co., Limited. *See* GROUP CXXIX.

Lorrain, James. *See* GROUP CXXVIII.

GROUP CXXXIV.

THE TELEPHONE AND ITS APPLIANCES. PHONOGRAPHS.

479 Homacoustic Speaking Tube, Co. (The), 17 & 18 Telegraph Street, London, E.C.

Attachments for voice tubes, homacoustic commutator with electric signalling device. (*See also* Complimentary List, page xxxiv.)

Anders & Kottgen, G. L. *See* GROUP CXXXIII.

British Government. *See* GROUP CXXXIII.

General Electric Co., Limited. *See* GROUP CXXIX.

Lorrain, James. *See* GROUP CXXVIII.

GROUP CXXXV.

ELECTRICITY IN SURGERY, DENTISTRY AND THERAPEUTICS.

Ash & Sons, Limited, Claudius. *See* GROUP CXLVIII.

GROUP CXXXVI.

APPLICATION OF ELECTRICITY IN VARIOUS WAYS NOT HEREINBEFORE SPECIFIED.

General Electric Co., Limited. *See* GROUP CXXIX.

Lorrain, James. *See* GROUP CXXVIII.

Van der Weyde. *See* GROUP CLI.

Department K.

FINE ARTS—PAINTING, SCULPTURE, ARCHITECTURE, AND DÉCORATION.

By J. E. HODGSON, R.A.,

Professor of Painting to the Royal Academy of Arts.

The second half of the nineteenth century has been an age of International Exhibitions, and these no doubt have had a powerful influence on the progress of Art; they enabled artists and the public at large to compare the art products of different countries, and their periodical recurrence served as points of departure, from which may be traced new tendencies and developments.

They have unquestionably had the effect of making Art in all its branches more cosmopolitan in character. It is as though the artists from all the world, from England, France, Holland, Germany and Italy, from America, and even from far-off Japan, had met together to exchange ideas and mutually to influence each other. But, as might have been expected, seeing that genius is inborn and not created by circumstances, their effect has been to raise the general level of excellence rather than to produce great masters. Architecture has necessarily been less swayed by foreign influences than the more impressionable sister arts of painting and sculpture: buildings are rooted to the spot where they were erected, and their fitness, their right keeping, their general impressiveness, in fact,

depend in a large measure on their surroundings, on the climate, and on the habits of the people whom they shelter. There is, however, a very noticeable improvement in our street architecture during the last twenty years, and ornament is no longer thought out of place in buildings devoted to the prosaic occupations of business. From the artist's point of view it is gratifying to see warehousemen and shopkeepers displaying nobler and wider instincts than the mere amassing of wealth.

But it is in painting and its kindred arts of drawing, etching, and engraving that the greatest improvement is noticeable.

It used to be popularly said abroad that England had no school of painting; it was not thought possible that there could be a school in a country where, as M. Ernest Chesneau puts it, there was no impress visible of a collective method of education, of official teaching, of an academy in Rome or of an *École des Beaux Arts*; and the Paris Exhibition of 1855 came upon French artists and critics as a great surprise; the collection of British pictures which was ranged in the humble little gallery devoted to them in the Avenue Montaigne acted with the force of a revelation. Here was a collection of pictures totally unlike anything they had seen before; and its leading characteristic, after careful scrutiny, they pronounced to be an absolute independence of all recognised formulæ. It was a school, they acknowledged, though based on the study of nature, rather than on any official system of education; and this impression produced by the gallery of British pictures in Paris in 1855 was repeated again in Vienna in 1873 and in Berlin in 1888.

There must have been a great deal in the British school when first presented to the most artistic and highly trained people of Europe which they could not understand, and much, no doubt which shocked their taste. We were then in the first excitement of the Pre-Raphaelite movement, and considerable excesses were unquestionably committed in the name of fidelity to nature; but these were, after all, a necessary and salutary reaction against the insular conventionalism into which the art had been drifting since the day of Sir Thos. Lawrence. The Pre-Raphaelite movement, under the direction of its prophet, Mr. J. Ruskin, had the salutary effect of

calling attention to nature, and it infused more earnestness and conscientiousness into the practice of the art; but it was in its nature an extreme, and as such could not last. What was wanted—a want which, happily, was supplied by the recurring International Exhibitions—was a purely artistic influence; and so it has come about that the pure naturalism of the British school has been subdued and tempered by contact with the rather too exclusively artistic character of French art. It has gained enormously in the process, without losing much of the distinctive character which surprised the Parisians so powerfully in 1855, as is proved by the increased interest and appreciation with which they regarded the British pictures exhibited in the exhibitions of 1878 and 1889.

One element has dropped out of our pictures to a great extent, and appears likely to disappear altogether, that may be called the literary element. Whereas forty years ago, in a figure picture, it was not thought possible to command attention or to gratify the intellect, except by illustrating some author, poet, novelist, or historian, art in these later days is allowed to assume a prouder and more independent attitude and to rely on its own resources. The anecdote is fast disappearing from pictures, and its place is taken by careful elaboration of the aspect.

Archæology has also crept in largely as a source of interest; the life of the ancients is depicted with a profound knowledge of details which has been acquired by ransacking all the museums; architecture, when it enters into the composition of a picture, is always learned and appropriate; and in all matters relating to costume and appurtenances there is the utmost historical accuracy. In all purely technical qualities, such as drawing, composition, light and shade, and colouring, there has been equal progress. The reproach once made by the French artist to the Englishman that he could not draw is no longer possible; it is wiped out now, and, in the matter of pure accuracy and taste in drawing, this country is beginning to take the lead of all others, with America running very close, as I shall point out when I come to the subject of book illustrations.

Portraiture, since England had an indigenous school, has always

been successfully practised; it has had the great traditions of Reynolds and Gainsborough to support it, and the impulse toward the observation of character and of expression originally given by Hogarth has remained a national characteristic. In the Berlin Exhibition in 1888 the British portraits attracted universal attention for their individuality and life-like character; but the memory of that triumph is saddened by the thought that Frank Holl, whose name was on everybody's lips, sheds lustre on British portraiture no more.

Landscape and marine painting are two branches of the art which have in like manner flourished in this country; we may almost say that it is their true home, and that, though Claude, Poussin and the Dutch landscapists were first in the field, the modern development of the art abroad owed its impulse to the example of Gainsborough, Turner, and Constable.

All the conditions in this country seem favourable to it. The love of nature and of outdoor pursuits, which is common to Englishmen, makes the landscape picture popular, and leads to abundant patronage. The wonderfully varied configuration of the land, with its masses of trees and luxuriant vegetation; the lakes, rivers and estuaries; the grandeur and variety of its coast line, washed as it is by veritable and mischievous billows, compared with which the waves of Claude and Van de Weydt are mere foolishness; the skies rarely clear, and often as restless and awe-inspiring as are the seas, all supply the landscape painter with an inexhaustible field of study. Hundreds of landscapes are produced annually in the United Kingdom, and if we compare them with those of other countries, we shall find they far surpass them in variety, in the number of them, and in the incidents of weather, and of natural effects represented.

Under the impulse of the naturalistic movement which set in forty years ago, English landscapes showed a tendency to run into greenness and redundancy of detail; but of late years they have assumed a soberer and more impressive aspect, partly from French influence, and partly because general artistic improvement has brought with it an increased appreciation of richness and tone as a source of grandeur and distinction.

Fully to appreciate the scope and versatility of British landscape art, it is necessary to study the water-colour examples side by side with those in oil. The portability of the former material and the superior facilities it offers for rapid work have made it the favourite vehicle for actual studies from nature done in the field; and every familiar aspect, every phase of her restless activity, seem to have been reproduced. There is a typical English landscape which is unique and has no prototype in all the world, which may perhaps appear to have been unnecessarily repeated; if so, it is because it is dear to the hearts of Englishmen, and they never weary of it.

It rises up before my mind's eye as I write.

Scattered irregularly on a slope of emerald green meadows is a country village; its old brick and timber cottages are roofed with moss-grown tiles or thatched with straw; hard by stands an ancient church with a low square tower, under the shadows of tall elms almost as ancient; a great yew-tree spreads its gnarled branches over the mouldering tombstones in the churchyard, and overhead the rooks are circling in the evening sky. It is a scene which belongs to an old world, and lies remote from the storm and stress of modern life—hence perhaps its popularity as a picture. Certain it is that a sense of remoteness, of peacefulness and seclusion are the prevailing sentiments which can be traced like a dominant chord running through the entire mass of British landscape art. Whereas in marine paintings another note is struck. Here we are reminded of the brisk cheerfulness, the eager alacrity which belong to the sailor, and the prevailing tone of pictures which represent the sea may be summed up in the words brightness, wetness and breeziness.

It is obvious that art products must obey the universal law which bids supply to wait upon demand; but in the case of those I have been describing the supply satisfies the tastes and adds to the luxury of private individuals only, the demand is not sufficiently extensive to warrant the use of the word commercial; whereas in another branch of art—that of illustrations to books and periodicals—the demand is so widespread and so constant as to constitute a ready

market in the business sense of the term, and accordingly we find a supply springing up to meet it. This is a form of art almost entirely of modern growth; it has arisen out of the exigencies of the hour; it was founded on no precedents or examples, and hence its vitality and its freshness. This is the peculiar art of the nineteenth century, as the painting of Madonnas was of the fifteenth.

Artists, publishers, and the public have combined to fix the standard of its excellence, just as artists, priests, and worshippers combined to fix that of the devotional pictures in the middle ages. The laws which govern the practice of this art may be said to be made from day to day—they spring up as circumstances require and as facilities of reproduction are perfected. The art of wood engraving has of necessity kept equal step with that of drawing, and from having been purely mechanical it has become, in a very high degree, artistic. In this latter branch America has taken the lead, and the illustrations to *Harper's Magazine* and the *Century* have acted as a powerful stimulus to wood engraving in this country. In drawing also American artists have developed extraordinary talent and skill, and without attempting to judge between them, I may say they fairly dispute the palm with Englishmen.

It is a common observation that phenomena cease to astonish when they become familiar, and we select our illustrated papers and magazines from the contents of a railway bookstall without its ever occurring to us that there is spread before us an array of talent and skill, which, were it suddenly presented to an artist of the last century, would make him speechless with astonishment and admiration; and it is no exaggeration to say that you can now buy for a penny what is essentially a work of art and superior to anything of the kind that could have been produced a hundred years ago. I have no hesitation in saying, that for correctness of drawing, for subtlety of gesture and expression, for delicacy of touch, and for power and brilliancy of effect, the woodcuts of the present day, sold in hundreds daily in our streets, surpass anything the world has ever seen before—of their kind.

The art of sculpture, unfortunately, is pining for want of the

nourishment which has so powerfully stimulated illustration and wood engraving. It would almost seem that the most ancient of the plastic arts was destined to be elbowed on one side in the march of modern civilization—to be, so to speak, shunted into a siding and forgotten there, while the world rushes by at express speed.

Our streets and houses are getting too crowded with living figures to leave much room for inanimate stone effigies of men. Modern habits render it almost impossible for private individuals to give much encouragement to sculpture; it is a matter for states, municipalities, and public bodies generally—a matter which all lovers of art should do their utmost to call attention to, if they desire to preserve this majestic art from decay.

There are many able sculptors amongst us—the art, in fact, stands on a much higher level than when the first public show of British statues was made in 1862. In sculpture, perhaps, more than in any other branch of art, the influence of French examples has been of value—it has infused vitality. Time was when, in this country, it was in ordinary hands little better than carving figures out of stone; they are now modelled with the sculptor's fingers—a wide distinction, which all those who have studied the art will appreciate.

But the art, unfortunately, may be said to be like the winged Enceladus imprisoned in the rock, waiting to be liberated by the touch of patronage.

I have alluded to the International Exhibitions which have been held in Europe and America since 1851. There is one very notable result of the first of those—namely, the foundation throughout the United Kingdom of schools of design, which are administered by the Department of Science and Art at South Kensington, to which we owe a great improvement in the arts of design as applied to industry. There is hardly any product into which art enters which does not show a marked improvement in taste, more grace and intelligence in design, more harmony in colour, and more adaptability of ornamentation than what the world was satisfied to tolerate fifty years ago. Much there is, doubtless, still to be done;

but to arrive at it the public must work in harmony with schools of design, and I can think of no better means of educating public taste than by exhibiting art products on a large and comprehensive scale—art work becomes impressive by its mass, and the influence of beauty becomes stronger when it is accumulated, whilst the counter-proposition is also true, that ugliness becomes more repulsive when there is much of it.

The sight of beautiful things is the best—perhaps only—panacea to cure that worst of the maladies of taste, the canker of all good art, namely, vulgarity.

DEPARTMENT K.

FINE ARTS, PAINTING, SCULPTURE, ARCHITECTURE, AND DECORATION.

The Exhibits in this Department are in the Art Galleries.

Information regarding the works that are for sale may be obtained on application to the Superintendent of the British Fine Art Section in the Galleries.

GROUP CXXXIX.

SCULPTURE.

Allen, Charles J., 41 Howland Street, Fitzroy Square, London.

1. REPULSED.

Bates, Harry, A.R.A., 10 Hall Road, St. John's Wood, London.

2. ENDYMION.

3. THE STORY OF PSYCHE.

Brown, Miss B. A. M., Willoughby, Rectory Road, Beckenham, Kent.

4. THE PEARL (Marble Group).

Dressler, Conrad, 41 Glebe Place, Chelsea, London.

5. BACCHANTE.

6. "MEWLING AND PUKING IN THE NURSE'S ARMS."

7. GIRL TYING ON HER SANDALS.

Drury, Alfred, 6 Gunter Grove, Chelsea, London.

8. THE FIRST REFLECTION.

Fehr, H. C., The Studio, 30 Osnaburgh Street, Regent's Park, London.

9. MORNING.

Ford, E. Onslow, A.R.A., 62 *Acacia Road, London.*

10. STATUE OF HENRY IRVING AS "HAMLET."

11. RIGHT HON. W. E. GLADSTONE.

12. GENERAL GORDON ON CAMEL.

Frampton, George, *Studio, 98A Warner Road, Camberwell Green.*

13. CAPRICE.

Lent by **C. Mitchell, Esq.**

14. SINGING GIRL.

Lent by **Arthur Leslie Collie, Esq.**

15. ST. CHRISTINA.

16. MYSTERIARCH.

Holiday, Henry, *Oak Tree House, Branch Hill, Hampstead, London.*

17. SLEEP.

John, W. Goscombe, 34 *Finchley Road, St. John's Wood, London.*

18. MORPHEUS.

19. STUDY OF A FEMALE HEAD.

Joy, Albert Bruce, *The Studio, Beaumont Road, West Kensington, London.*

20. THE MARQUIS OF SALISBURY.

21. THE ARCHBISHOP OF CANTERBURY.

22. MRS. MARY ANDERSON NOVARRO.

Lee, Thos. Stirling, *Merton Villa Studios, Chelsea, London.*

23. KISS OF DAWN.

24. BRONZE MEDALLION.

Leighton, Sir Frederick, Bart., P.R.A., 2 *Holland Park Road Kensington, London.*

25. NEEDLESS ALARMS.

Lent by **Sir John E. Millais, Bart, R.A.**

26. THE SLUGGARD.

MacLean, T. Nelson, 13 *Bruton Street, London.*

27. TRAGEDY.

28. COMEDY.

29. LA SOURCE.

Montalba, Miss Henrietta S., *Palazzo Trevisan, Campo S. Agnese, Venice, Italy.*

30. BOY CATCHING A CRAB.

Montford, Horace, 8 *Winders Road, Battersea, London.*

31. THREATENED REPRISALS.

32. THE BIRTH OF VENUS.

Moore, Miss E. M., 4 *Bath Road, Bedford Park, London.*

33. BUST OF A CHILD.

34. A RUFFIAN.

Palmer, Miss Ada M., *Turnours Hall, Chigwell, Essex.*

35. THE PIED PIPER OF HAMELIN.

Pomeroy, F. W., 1 *Wentworth Studios, Manresa Road, Chelsea, London.*

36. DIONYSIUS.

37. GIOTTO.

Lent by H. Pfungst, Esq.

Rhodes, Roland, *Newcastle, Staffordshire.*

38. EGYPTIAN HARPIST.

39. YOUTH'S FIRST RECOGNITION OF LOVE.

Swan, John M., 3 *Acacia Road, St. John's Wood, London.*

40. TIGER.

41. LIONESS.

42. LEOPARD.

Thornycroft, Hamo, R.A., 2 Melbury Road, Kensington, London.

43. THE MOWER.

44. TEUCER.

Lent by The Art Institute, Chicago.

45. EDWARD I.

46. PUTTING THE STONE.

Toft, Albert, Trafalgar Studios, Manresa Road, Chelsea, London.

47. THE RIGHT HON. W. E. GLADSTONE.

Watts, G. F., R.A., Little Holland House, Kensington, London.

48. CLYTIE.

Woolner, Thomas, R.A. (the late).

49. BUST OF LORD TENNYSON,

Lent by Mrs. Woolner.

50. BUST OF CARLYLE.

Lent by Mrs. Woolner.

51. BUST OF CARDINAL NEWMAN.

Lent by Mrs. Woolner.

52. BUST OF RIGHT HON. W. E. GLADSTONE.

Lent by Mrs. Woolner.

53. MEDALLION PORTRAIT OF LORD TENNYSON.

Lent by Mrs. Woolner.

GROUP CXL.

PAINTINGS IN OIL.

Allan, Robert W., R.W.S., 10 Boscobel Place, St. John's Wood,
London.

54. LOWLANDS OF HOLLAND.

55. PILGRIMS RESTING, INDIA,

Alma Tadema, Miss Anna, 17 *Grove End Road, St. John's Wood, London.*

56. A PORTRAIT.

Alma Tadema, L., R.A., 17 *Grove End Road, St. John's Wood, London, N.W.*

57. A DEDICATION TO BACCHUS.

Lent by **His Excellency Monsieur E. Gambart**,
Spanish Consul, Nice.

58. AN AUDIENCE AT AGRIPPA'S.

Lent by **J. S. Roberts, Esq.**

59. THE SCULPTURE GALLERY.

Lent by **George McCulloch, Esq.**

Alma Tadema, Mrs., 17 *Grove End Road, St. John's Wood, London.*

60. BATTLEDORE AND SHUTTLECOCK.

Lent by **E. H. Van Ingēn, Esq.**

61. FIRESIDE FANCIES.

Lent by **E. H. Van Ingen, Esq.**

62. ALWAYS WELCOME.

Lent by **Merton Russell Cotes, Esq., F.R.G.S.**

Archer, James, R.S.A., 7 *Gloucester Mansion, 1 Harrington Gardens, London.*

63. ST. AGNES, ONE OF THE EARLY CHRISTIAN MARTYRS.

Armitage, E., R.A., 3 *Hull Road, St. John's Wood, London.*

64. AFTER AN ENTOMOLOGICAL SALE.

65. FAITH (LUKE VIII. 43, 44).

Armstrong, T., *Department of Science and Art, South Kensington Museum, London.*

66. A FOUNTAIN.

Lent by **Mrs. Lees Evans.**

67. A MUSIC-PIECE.

Lent by **J. Walker, Esq.**

Aumonier, J., R.I., 115 *Gower Street, London.*

68. AN ENGLISH WOOD.

Baden-Powell, F., 8 *St. George's Place, Hyde Park Corner, London.*

69. THE WOODEN WALLS OF QUEEN VICTORIA.

Portraits of the last of England's wooden bulwarks, lying off Portsmouth Dockyard, about 1840. The "Britannia," of 120 guns, on the right, was flagship of the port; the two-decker being the "London," of 92 guns, whilst the central three-decker, drying her sails, is the "Queen," of 110 guns; and on the extreme left lies the fast-sailing frigate "Arethusa."

Lent by **E. S. Heywood, Esq., J.P.**

Barber, C. Burton, 1 *Titchfield Road, North Gate, Regent's Park, London.*

70. "LIEDER OHNE WORTE."

Lent by **William Yeats Baker, Esq.**

71. THE NEW WHIP.

Lent by **William Yeats Baker, Esq.**

Barclay, Edgar, 1 *Elm Villa, Elm Row, Hampstead, London.*

72. "HUSH."

73. A BREEZE IN THE NEW FOREST.

Barnes, Robert, A.R.W.S., *Ormonde House, 6 Clevedon Place, Brighton, Sussex.*

74. HER FIRST VISIT.

Lent by **J. B. Sutherland, Esq.**

Bartlett, Charles W., 11 *Holland Park Road, London, W.*

75. 1793. AN INCIDENT IN THE LIFE OF THE DAUPHIN
DURING THE FRENCH REVOLUTION.

Bartlett, W. H., 113 *Church Street, Chelsea, London.*

76. PRACTISING FOR THE SWIMMING MATCH.

Lent by **Henry Whitehead, Esq.**

77. THE VILLAGE BILLIARD PLAYERS.

Lent by **E. de la Penha, Esq.**

78. A WRACK HARVEST.

Lent by **E. Stainton, Esq.**

Bates, David, *Temple Chambers, Broad Street Corner, Birmingham.*

79. THE SPHINX.

Bayliss, Wyke, P.R.B.A., *North Road, Clapham Park, London.*

80. INTERIOR OF AMIENS CATHEDRAL.

81. INTERIOR OF ST. PETER'S, ROME.

Beadle, James Prinsep, 17B *Eldon Road, Victoria Road, Kensington, London.*

82. MASQUERADE.

The outside of the Grand Opera, Paris, during Carnival, masquers coming out from a bal masqué, mounted Garde de Paris in the foreground.

83. IN THE PAS DE CALAIS.

Lent by **General Beadle.**

Beavis, Richard, A.R.W.S., 16 *Notting Hill Square, Campden Hill, London.*

84. A STAMPEDE IN THE HIGHLANDS.

Belgrave, Percy, 8 *Percy Street, Bedford Square, London.*

85. COMBE VALLEY, NEAR MORWENSTOW.

Bigland, Percy, 32 *Tite Street, Chelsea, London.*

86. PORTRAIT OF THE COUNTESS CAIRNS.

Lent by **The Countess Cairns.**

Boughton, G. H., A.R.A., *West House, Campden Hill Road, Kensington, London.*

87. DANCING DOWN THE HAY.

Lent by **Sir Edward H. Carbutt, Bart.**

88. WINTER SUNRISE.

89. LOVE IN WINTER.

Bourdillon, Frank W., *Normanholt, Dorking, Surrey.*

90. ON BOARD THE 'REVENGE,' 1591.

"Sink me the ship, master gunner."—*Tennyson.*

91. "'T WAS IN '55."

Lent by **John Lewis, Esq.**

Bramley, Frank, *Newlyn, Penzance.*

92. A HOPELESS DAWN.

Lent by **T. Harry Eve, Esq.**

93. "FOR OF SUCH IS THE KINGDOM OF HEAVEN."

Lent by **George McCulloch, Esq.**

Brangwyn, Frank, *4 Stratford Studios, Stratford Road, Kensington, London.*

94. THE CONVICT SHIP.

95. PILOTS, PEURTA DE PASSAGES.

Brëtt, John, A.R.A., *Daisyfield, Putney, Surrey.*

96. THE HIGHLAND SUMMER.

97. THE PROMISE OF A WILD NIGHT.

98. "SOME FALL ON STONY GROUND."

Brown, Ford Madox, *1 St. Edmund's Terrace, Regent's Park, London.*

99. ROMEO AND JULIET.

Lent by **James Leathart, Esq.**

100. WICLIF ON TRIAL. Designed for Manchester Town Hall.

Lent by **Henry Boddington, Esq.**

Brown, Frederick, 9 *Victoria Grove, Fulham Road, London.*

101. "WHEN THE EVENING SUN IS LOW."

Burgess, J. B., R.A., 60 *Finchley Road, London.*

102. THE SPANISH LETTER-WRITER.

Lent by **Joseph Pulley, Esq.**

103. THE CHURCH DOOR.

Lent by **Sir Julian Goldsmid, Bart, M.P.**

104. "MAIDENS, LIKE MOTHS, ARE EVER CAUGHT WITH
GLARE."

Lent by **George McCulloch, Esq.**

Butler, Lady.

105. THE ROLL CALL.

Lent by **Her Majesty the Queen.**

Calderon, W. Frank, 26 *Carlingford Road, Hampstead, London.*

106. "FIRE!"

Calderon, P. H., R.A., *Burlington House, Piccadilly, London.*

107. FAREWELL.

Lent by **The Fine Art Society.**

Caldecott, Randolph (the late).

108. HUNTING SCENE.

Lent by **Messrs. Thos. Agnew & Sons.**

Calkin, Lance, 1 *Cheniston Gardens Studios, Kensington, London.*

109. "THE CAMPBELLS ARE COMING."

Calthrop, Claude, *Beach House, The Mall, Hammersmith, London.*

110. ATTEMPTED ASSASSINATION OF WILLIAM THE SILENT,
PRINCE OF ORANGE.

Cameron, Hugh, S.R.A., *Viewforth House, Largo, Fife, N.B.*

111. KILMENY COMING BACK FROM FAIRYLAND.

From the poem by Hogg, "The Ettrick Shepherd."

Lent by **James Lindsay, Jnr., Esq.**

112. BUTTERCUPS AND DAISIES.

Portrait of a little girl—the artist's daughter.

Canziani, Madame Louisa Starr, *3 Kensington Palace Green, London.*

113. TWO LITTLE "HOME RULERS"—THE HONBLE. DUDLEY
AND ARCHIE GORDON, SONS OF THE EARL OF ABERDEEN.

Lent by **The Earl of Aberdeen.**

Carter, Samuel J. (the late), *care of Vernet Carter, Esq., Stamford House, 428 Fulham Road, London.*

114. MIDNIGHT RIDE OF HERNE THE HUNTER AND HIS BAND
IN WINDSOR FOREST.

Carter William, *Carlyle Studios, 296 King's Road, Chelsea, London.*

115. PORTRAIT OF WM. SHEPPARD HOARE, ESQ.

Lent by **W. S. Hoare, Esq.**

116. PORTRAIT OF G. TRENCHARD COX, ESQ.

Lent by **E. A. Cox, Esq.**

Charles, James, *Colnor House, Bosham, Chichester.*

117. IN MEMORY OF.

Lent by **John Maddocks, Esq.**

118. LEFT IN CHARGE.

Lent by **John Maddocks, Esq.**

119. A FROSTY MORNING.

Lent by **John Maddocks, Esq.**

120. JACK AT HOME.

Lent by **John Wm. Smith, Esq.**

Charlton, John, 22 *West Cromwell Road, London.*

121. THE ROYAL JUBILEE PROCESSION PASSING THROUGH TRAFALGAR SQUARE.

Lent by Her Majesty the Queen.

122. INCIDENT IN THE CHARGE OF THE LIGHT BRIGADE.

Childers, Miss Milley, *Studio, Adam and Eve Mews, High Street, Kensington, London.*

123. THE LAST SURVIVOR OF TRAFALGAR.

Emmanuel Cartigny, died 1892, aged 100 years.

Clark, James, 10 *Victoria Grove, Fulham Road, London.*

124. THE FAVOURITE.

125. EARLY TO BED.

Clark, Joseph, 23 *Greencroft Gardens, South Hampstead, London.*

126. THE SICK CHILD.

Lent by H. J. Turner, Esq.

127. WAIFS AND STRAYS.

Lent by Charles B. Clarke, Esq.

128. PLAYMATES.

Clausen, George, R.I., *Widdington, Newport, Essex.*

129. PLOUGHBOY.

Lent by Alex. Young, Esq.

130. BROWN-EYES.

Lent by C. N. Luxmoore, Esq.

131. WOMEN OF THE FIELDS.

Lent by J. Dunnachie, Esq.

132. THE BREAKFAST TABLE.

133. PLOUGHING.

Lent by Messrs. Boussod, Valadon & Co.

Cohen, Miss Ellen G., 21 *Hamilton Terrace, St. John's Wood, London.*

134. A LITTLE REFUGEE FROM RUSSIA.

Coke, Alfred Sacheverel, *Totland Bay, Isle of Wight.*

135. HAGAR.

Cole, Vicat, R.A., *Little Campden House, Campden Hill, London.*

136. ABINGDON.

Lent by George McCulloch, Esq.

137. RIPENING SUNBEAMS.

Lent by The Lord Brassey.

Collier, The Hon. John, *North House, Eton Avenue, London.*

138. THE DEATH OF CLEOPATRA.

Lent by The Corporation of Oldham.

139. CIRCE.

Lent by Elliott Lees, Esq., M.P.

Corbet, Mrs. M. Ridley, *54 Circus Road, St. John's Wood, London.*

140. ON THE COAST NEAR PISA.

Corbet, M. Ridley, *54 Circus Road, St. John's Wood, London.*

141. THE CARRARA MOUNTAINS.

142. THE MOUTH OF THE ARNO.

Lent by Mrs. Devitt.

Crane, Walter, *13 Holland Street, Kensington, London.*

143. FREEDOM.

Davis, H. W. B., R.A., *18 St. John's Wood Road, London.*

144. "NOW CAME STILL EVENING ON."

Lent by George McCulloch, Esq.

145. A GLEAMY DAY, PICARDY.

Lent by George McCulloch, Esq.

146. THE WESTERN HIGHLANDS.

Dawson, Nelson, 4 *Wentworth Studios, Manresa Road, Chelsea, London.*

147. THE SUNSET BREEZE.

Detmold, H. E., *Sunny Bank, Ore, Hastings.*

148. A GLIMPSE OF FUTURE SEAS.

Dicksee, Frank, A.R.A., 80 *Peel Street, Campden Hill, Kensington, London.*

149. THE PASSING OF ARTHUR.

Lent by **Stephen G. Holland, Esq.**

150. THE REDEMPTION OF TANNHAUSER.

Lent by **Thomas D. Galpin, Esq.**

Dobson, W. C. T., R.A., R.W.S., *Lodsworth, Petworth, Sussex.*

151. THE WANDERING MINSTREL.

East, Alfred R. I., 4 *Grove End Road, St. John's Wood, London.*

152. AN ANGRY DAWN.

Lent by **G. McCulloch, Esq.**

153. THE ARMS OF PEACE.

Ellis, Edwin, 76 *Newman Street, London.*

154. FULL SUMMER, FLAMBRO'.

Lent by **W. E. Hartshorn, Esq.**

Emslie, A. E., 12 *Melina Place, London.*

155. SAVING THE SHIPWRECKED.

156. PORTRAIT OF THE REV. JAMES MARTINEAU, D.D.,
D.C.L., LL.D.

Etherington, Miss L., 1 *Hereford Square, South Kensington, London.*

157. A NORFOLK DYKE.

Fabey, Edward H., R.I., 28 *Dawson Place, Bayswater, London.*

158. DISTANT VIEW OF FLORENCE, LOOKING UP THE ARNO.

159. THE NETHER POOL, A NIBBLE.

160. AUTUMN.

Farquharson, Joseph, 2 *Porchester Gardens, London.*

161. LOOKING WEST.

162. THE TEMPLE OF KARNAC.

Farquharson, David, 5 *Wychcombe Studios, London.*

163. AFTER THE STORM, GLENLYON.

Lent by **F. Acton, Esq.**

164. MORNING ON THE COMMON.

Fisher, S. Melton, *Arts Club, Hanover Square, London.*

165. A SUMMER NIGHT.

Fisher, Horace, *Elmfield, Half Moon Lane, Herne Hill, London.*

166. THE CARD PLAYERS.

167. A MID-DAY REST.

Fletcher, Morley, 18 *Notting Hill Grove, London.*

168. SHADOW OF DEATH.

Fletcher, Blandford, *Esmonds, Old Park Road, Enfield, Middlesex.*

169. EVICTED.

Forbes, Mrs. Stanhope, 134 *Elgin Avenue, London.*

170. THE WITCH.

Lent by **George McCulloch, Esq.**

Forbes, Stanhope A., A.R.A., 134 *Elgin Avenue, London.*

171. FORGING THE ANCHOR.

Lent by **George McCulloch, Esq.**

172. SOLDIERS AND SAILORS.

Lent by **George McCulloch, Esq.**

Frith, W. P., R.A., *Ashenhurst, Sydenham Rise, London.*

THE RACE FOR WEALTH (a Series of Five Pictures)—

173. THE SPIDER AND THE FLIES.

174. THE SPIDER AT HOME.

175. VICTIMS.

176. JUDGMENT.

177. RETRIBUTION.

Lent by **Maurice N. Newton, Esq.**

Fulleylove, John, R.I., *50 Great Russell Street, London.*

178. A ROYAL PALACE.

Lent by **The Corporation of Leicester.**

Furse, Charles W., *33 Tite Street, Chelsea, London.*

179. LADY IN GREY.

180. LADY IN BROWN RIDING HABIT.

Glazebrook, Hugh de T., *76 Elm Park Road, Chelsea, London.*

181. C'EST L'EMPEREUR.

Napoleon I. finding a sentry asleep on duty.

182. PORTRAIT.

Goodall, Frederick, R.A., *62 Avenue Road, Regent's Park, London.*

183. BY THE SEA OF GALILEE.

184. THE PALM OFFERING.

Lent by **Merton Russell Cotes, Esq., F.R.G.S.**

Goodall, T. F., *Elms Road, Dulwich.*

185. THE LAST OF THE EBB: GREAT YARMOUTH FROM BREYDON WATER.

186. WHEN THE SUN SETS AND THE MOON RISES.

Gotch, T. C., 70 Gower Street, London.

187. "MY CROWN AND SCEPTRE."

Gow, A. C., R.A., 15 Grove End Road, London.

188. QUEEN MARY'S FAREWELL TO SCOTLAND.

Lent by George McCulloch, Esq.

Grace, A. F., Chantrey Green House, Steyning, Sussex.

189. WORKING LATE IN VALLEY OF THE ARUN.

190. THE VALLEY OF THE CUCKMERE.

Lent by The Corporation of Brighton.

Grace, James E., Milford, Godalming, Surrey.

191. AN ISLE OF WIGHT PASTORAL.

192. A SURREY POND.

Graham, Peter, R.A., 93 Ladbroke Road, Notting Hill, London.

193. "CALEDONIA STERN AND WILD."

Lent by George McCulloch, Esq.

194. THE HAMLET ON THE CLIFF—A ROCKY COAST.

Lent by George McCulloch, Esq.

Graham, T., 98 Fellows Road, Hampstead, London.

195. THE LAST BOAT.

Grey, Alfred, R.H.A., 1 Lower Sherrard Street, Mountjoy Square, Dublin.

196. AN IRISH HARVEST FIELD : PEASANTS LOADING CORN.

Hacker, Arthur, 74 Fellows Road, South Hampstead, London.

197. CHRIST AND THE MAGDALEN.

198. PORTRAIT OF MISS W.

199. FIRE FANCIES.

Hague, Anderson, R.I., *Deganway, Llandudno, Wales.*

200. GYFFIN OLD MILL.

Hall, Fred., *Newlyn, Penzance, Cornwall.*

201. ADVERSITY.

202. THE RESULT OF HIGH LIVING.

Halswelle, Keeley (the late).

203. A BREEZY COMMON.

Lent by Messrs. Arthur Tooth & Sons.

Hare, St. George, *Bolton Studios, Redcliffe Road, London.*

204. THE VICTORY OF FAITH.

205. REFLECTIONS.

Hargitt, Edward, R.I., *1 Gladstone Villas, South View, Basingstoke, Hants.*

206. THE ISLE OF SKYE FROM THE MAINLAND, NEAR PLOCKTON.

Hartley, Alfred, *6 Wentworth Studios, Manresa Road, Chelsea, London.*

207. TRAFALGAR SQUARE.

Hayes, Edwin, R.H.A., R.I., *Olive Villa, Quex Road, West Hampstead, London.*

208. HARD A PORT.

209. SAVED.

Hayes, Claude, *The Cottage, Woburn Park, Addlestone, Surrey.*

210. ACROSS A SURREY COMMON.

Haynes-Williams, J., *Shirley Place, near Southampton.*

211. GALLERY OF FRANCIS I., PALACE OF FONTAINEBLEAU.

Helcké, Arnold, *1 Langham Chambers, Portland Place, London.*

212. SANDBANKS.

Herkomer, Professor H., R.A., *Dyreham, Bushey, Herts.*

213. THE LAST MUSTER.

Lent by **W. Cuthbert Quilter, Esq., M.P.**

214. MISS KATHARINE GRANT.

215. ENTRANCED.

“In some diviner mood of self-oblivion solitude.”

Herkomer, Herman G., *6 William Street, Lowndes Square, London.*

216. PORTRAIT OF PROFESSOR HUBERT HERKOMER, R.A.

217. DAVID BISPHAN IN “LA BOSCHE.”

Hitchens, A., *35 Kensington Square, London.*

218. FISHERWOMEN AWAITING THE BOATS, HOLLAND.

Holiday, Henry, *Oak Tree House, Branch Hill, Hampstead, London.*

219. ASPASIA.

220. STREET OF TOMBS, POMPEII.

Holl, Frank, R.A. (the late).

221. PORTRAIT OF JOHN TENNIEL.

Mr. Tenniel was born in 1820. In 1851 he became a member of “Punch’s” staff, and from that time he has contributed to the illustrations of that celebrated periodical. For a long period, without the break of a single week, he has produced the political cartoon, and may thus claim a high place, not only as an artist, but as a historian of the time.

Lent by **William Agnew, Esq.**

222. SAMUEL COUSINS, R.A.

Lent by **Mrs. Frank Holl.**

223. THE EARL SPENCER, K.G.

Lent by **The Earl Spencer, K.G.**

224. PORTRAIT OF THE LATE J. S. MORGAN.

Lent by **Pierpoint Morgan, Esq.**

225. PORTRAIT OF MAJOR-GENERAL SIR HENRY RAWLINSON,
BART., G.C.B., F.R.S., &c.

Lent by **Sir H. Rawlinson, Bt., G.C.B.**

Holloway, C. E., 24 *Soho Square, London.*

226. THE OLD TOWN OF RYE.

Lent by Robert Riddick, Esq.

Hook, J. C., R.A., *Silverbeck, Churt, Farnham, Surrey.*

227. WRECKAGE FROM THE FRUITER.

228. "LITTLE TO EARN AND MANY TO KEEP."

Lent by Messrs. Thos. Agnew & Sons.

Hopkins, Arthur, A.R.W.S., 80 *Finchley Road, London.*

229. "SPRING-TIME, THE ONLY PRETTY RING-TIME."

Horsley, John Callcott, R.A., 1 *High Row, Kensington, London.*

230. HIDE AND SEEK.

In Kentish churchyards many 17th century tombs are still to be found in varied conditions of picturesque decay, amongst which the village children spend much of their playtime. Bright young life seen literally hiding in the tomb formed a striking contrast, which suggested a subject for pictorial record.

231. FINISHING TOUCHES.

Horsley, Walter C., 1 *High Row, Kensington, London.*

232. THE CAPTIVE.

"Till the end of the eighteenth century, European children were often captured in merchant vessels, seized by the corsairs of the Mediterranean. They were purchased for youthful attendants in the hareems, and eventually trained as mamlukes or military slaves. These existed in Egypt as a military aristocracy, and were a powerful body at the time of the French invasion."

233. FORTUNE TELLER—CAIRO.

Hunt, Alfred W., R.W.S. 1 *Tor Villas, Campden Hill, London.*

234. FROM PEAK TO PEAK IN CLOUDLAND.

Lent by W. S. Caine, Esq., M.P.

Hunter, Colin, A.R.A., 14 *Melbury Road, Kensington, London.*

235. THE FIRST PLUNGE OF NIAGARA.

236. FISHERS OF THE NORTH SEA.

237. THE ISLAND HARVEST.

Lent by The Fine Art Society.

Hunter, G. Sherwood, 2 *Brick Court, Temple, London.*

238. CARRYING THE VIATICUM, FINISTERRE, FRANCE.

239. FUNERAL OF A FISHERMAN'S CHILD, VOLENDAM, ZUYDER
ZEE.

Huson, Thomas, R.I., *Northcote Street, Waterloo, Liverpool.*

240. "MISTS HUNG WIDE O'ER MOOR AND FELL."

Ingram, W. Ayerst, 6 *Wodehouse Terrace, Falmouth.*

241. SURF.

Jacomb-Hood, G.P., 26 *Tite Street, Chelsea, London.*

242. SUMMER.

Jay, W. S., *Brooklawn, Arundel, Sussex.*

243. EARLY PRIMROSE, HERALD OF SPRING.

Jenkins, Miss Blanche, 117 *Abbey Road, London.*

244. A WATER NYMPH.

Johnson, C. E., R.I., *Morven House, Steele's Road, Haverstock Hill, London.*

245. THE SLOPES OF BEN NEVIS.

Johnson, Cyrus, R.I., 21 *Devonshire Street, Portland Place, London.*

246. A COUNTY BOUNDARY.

Jolley, Gwilt, care of R. J. Stannard, 30 *Great Russell Street, London.*

247. CONSOLATRIX AFFLICTORUM.

Jones, Sir Thomas A., P.R.H.A., 41 *Morehampton Road, Donnybrook, Dublin.*

248. LORELI.

Jopling-Rowe, Mrs. Louise, 3 *Pembroke Road, Kensington, London.*

249. "DEAR LADY DISDAIN."

250. SALOME.

Joy, G. W., *The Red Lodge, Palace Court, Kensington, London.*

251. LADY DAFFODIL.

252. DANAIDS.

Kennedy, C. N., 38 *Avenue Road, St. John's Wood, London.*

253. PERSEUS.

Kennington, T. B., 8 *Victoria Grove, London.*

254. THE CURSE OF THE FAMILY.

255. THE FAIR HARPIST.

Lent by Mrs. Palmer.

King, Edward, *Harting, Petersfield, Hants.*

256. A FROLIC.

King, Yeend., R.I., 3 *St. John's Wood Studios, London.*

257. AUTUMN WOOLING.

Lent by **George McCulloch, Esq.**

258. THE LASS THAT LOVED A SAILOR.

Lent by **George McCulloch, Esq.**

259. A GREY DAY IN JULY.

Knight, Joseph, R.I., *Maesdola House, Llan-Rhos, near Llandudno.*

260. A TURNIP FIELD.

Lent by **Col. W. W. Mawson.**

Knight, J. W. Buxton, 181A *King's Road, Chelsea, London.*

261. SUNDAY MORNING, HADLEY CHURCH.

Hadley Church is close to Barnet, on the London and York road. It is very old, and has a "fire cradle" for signalling in olden times. The battle of Barnet was fought close to it; when the Earl of Warwick and his brother fought back to back for a long time before they were slain.

Lent by **J. Maddocks, Esq.**

262. PLYMOUTH.

The home of the first English Settlers in America.

Lent by **Henry Bonger, Esq.**

Laidlay, W. J., 50 *Circus Road, St. John's Wood, London.*

263. THE APPROACH.

264. MOONRISE ON HOSSEY MERE.

La Thangue, H. H., *Bosham, Chichester.*

265. LEAVING HOME.

Lent by **Isaac Smith, Esq., M.P.**

266. A GASLIGHT STUDY.

Lent by **John Maddocks, Esq.**

Lavery, John, 248 *West George Street, Glasgow.*

267. KATHERINE AND ESTHER.

Daughters of Lord McLaren.

Lent by Lord McLaren.

268. AN EQUESTRIENNE.

Lawson, Cecil (the late).

269. THE HOP GARDEN.

Lent by Mrs. Cecil Lawson.

Leader, B. W., A.R.A., *Burrows Cross, Shere, Guildford.*

270. CONWAY BAY AND THE CARNARVONSHIRE COAST.

Lent by George McCulloch, Esq.

271. WHEN SUN IS SET.

Lent by George McCulloch, Esq.

Lehmann, Rudolf, 28 *Abercorn Place, London.*

272. UNDINE.

273. THE REAPER AND THE FLOWERS (*Longfellow*).

Leighton, Sir Frederick, Bart., P.R.A., 2 *Holland Park Road, Kensington, London.*

274. HERCULES WRESTLING WITH DEATH FOR THE BODY OF ALCESTES.

Lent by Sir Bernhard Samuelson, Bart., M.P.

275. GARDEN OF THE HESPERIDES.

Lent by G. McCulloch, Esq.

276. PERSEUS AND ANDROMEDA.

277. PORTRAIT OF CAPTAIN BURTON.

Leighton, E. Blair, 7 *Priory Road, Bedford Park, London.*

278 THE SECRET.

Lent by T. J. Hirst, Esq.

279. HOW LISA LOVED THE KING.

"Lisa, the only child of a rich merchant of Palermo, having fallen ill through love of King Pietro of Sicily, asks his favourite musician, Minuccio, to come and sing to her."—*Boccaccio*.

Lent by Merton Russell Cotes, Esq., F.R.G.S.

Lemon, Arthur, *Brockham Green, Betchworth, Surrey.*

280. ALL AMONG THE BARLEY.

Leslie, G. D., R.A., *Riverside, Wallingford, Berks.*

281. HEN AND CHICKENS.

Lent by E. H. Van Ingen, Esq.

282. "HOME, SWEET HOME."

Lent by Messrs. Thos. Agnew & Sons.

283. THE MONKS OF ABINGDON.

Lindner, M. P., *57 Bedford Gardens, London.*

284. A WINTER SUNSET.

Lent by M. Lindner, Esq.

285. MOONLIGHT.

Lent by Henry Roche, Esq.

Linnell, John (the late).

286. STORM AT HARVEST.

Lent by Samuel Montagu, Esq., M.P.

Linton, Sir James D., F.R.I., *5 Cromwell Place, South Kensington London.*

287. VICTORIOUS.

Lent by C. Jacoby, Esq.

288. THE BENEDICTION.

Lent by C. Jacoby, Esq.

Lockhart, W. E., R.S.A., *16 Phillimore Gardens, Kensington London.*

289. THE SWINEHERD.

Lent by The Trustees of the Dundee Free Library.

290. PORTRAIT OF JOHN POLSON, ESQ.

Lent by John Polson, Esq.

Logsdail, William, care of C. M. May, 19 St. Ann's Court, Soho, London.

291. NINTH OF NOVEMBER.

292. SUNDAY IN THE CITY.

293. VENICE FROM THE PUBLIC GARDEN.

294. FLOWER GATHERING, SOUTH OF FRANCE.

Long, Edwin, R.A. (the late).

295. A WELSH GIRL.

Lent by Messrs. Thomas Agnew & Sons.

296. ROSE BRADWARDINE.

From Sir Walter Scott's "Waverley."

Lent by Messrs. Thomas Agnew & Sons.

Lorimer, J. H., 23 Edwardes Square, Kensington, London.

297. A CHILD'S THANK-OFFERING.

298. POT POURRI.

Loudan, Mouat, 11 Primrose Hill Studios, London.

299. FISH MARKET, CORNWALL.

Lucas, Seymour, A.R.A., New Place, Woodchurch Road, West Hampstead, London.

300. ST. PAUL'S.

Lent by W. George King, Esq.

301. LOUIS XI.

Lent by John Cheetham, Esq.

Lucas, Mrs. Seymour, New Place, Woodchurch Road, West Hampstead, London.

302. HENRY VI.

"By the Grace of God Kynge of England, of France,
and Lord of Ireland."

Lund, Niels M., 18 Fitzroy Street, London.

303. A SCOTCH RIVER.

"Where crowded waters glitter to the Moon."

Macallum, Hamilton, R.I., *Wychcombe Studios, Haverstock Hill, London.*

304. "ROCKED IN THE CRADLE OF THE DEEP."

Lent by **J. P. Heseltine, Esq.**

305. RETURN FROM LANCE FISHING.

Macartney, Carlile H. H., *care of Col. M. J. Macartney, 2 York Villas, Campden Hill, London.*

306. MOORLAND.

Lent by **F. Scorer, Esq.**

Macbeth, Robert W., A.R.A., *Longsden, 1a Carlton Hill, London.*

307. STAG HUNTING IN A SEA FOG.

308. THE FEN FARM.

Lent by **Messrs. Thomas Agnew & Sons.**

Macbeth-Raeburn, H., *6 St. Paul's Studios, West Kensington, London.*

309. NURSE ANN—A PORTRAIT.

310. LEWIS WALTER, ESQ.—A PORTRAIT.

Macgregor, Miss J., *care of W. Eden, Esq., 10 Hill Road, St. John's Wood, London.*

311. IN THE REIGN OF TERROR.

Lent by **The Corporation of Liverpool.**

312. THE MISLETOE BOUGH.

Lent by **Mrs. Miers.**

Maclaren, Walter, *22 King Henry's Road, St. John's Wood, London.*

313. FRUIT HARVEST-TIME IN AN ORANGE GARDEN, CAPRI
ITALY.

Macwhirter, John, A.R.A., *1 Abbey Road, St. John's Wood, London.*

314. "FAIRY OF THE GLEN."

Lent by **Henry Evans, Esq.**

315. CORRIE-ARRAN.

316. "HAIL, GENTLE SPRING."

Margetson, W. H., 7 *St. Paul's Studios, Talgarth Road, West Kensington, London.*

317. PYGMALION.

Marks, H. Stacy, R.A., 17 *Hamilton Terrace, St. John's Wood, London.*

318. THE GENTLE CRAFT.

Lent by E. Homan, Esq.

Mason, G. H. (the late).

319. GIRLS DANCING BY THE SEA.

Lent by The Lord Wantage, K.C.B., V.C.

320. THE HARVEST MOON.

Lent by Alexander Henderson, Esq.

321. RETURN FROM PLOUGHING.

Lent by Her Majesty the Queen.

322. ONLY A SHOWER.

Lent by Thomas L. Devitt, Esq.

McCulloch, George, care of Messrs. Smith & Uppard, 77 *Mortimer Street, London.*

323. CALIBAN AND ARIEL.

McLachlan, T. Hope, 20 *Fitzroy Street, London.*

324. MISTS IN EARLY AUTUMN.

325. A WIND ON THE HILL.

Menpes, Mortimer, *Osborn Lodge, Fulham, London.*

326. INDIA.

327. INDIA.

328. VENICE.

329. JAPAN.

Merritt, Mrs. Anna Lea, *The Limes, Hurstbourne Tarrant, Andover.*

330. EVE.

Lent by Alfred Waterhouse, Esq., R.A.

Millais, Sir John Everett, Bart., R.A., *2 Palace Gate, Kensington, London.*

331. THE ORNITHOLOGIST.

332. HALCYON WEATHER.

333. THE LAST ROSE OF SUMMER.

334. SWEET EMMA MORLAND.

335. LINGERING AUTUMN.

Lent by George McCulloch, Esq.

336. SHELLING PEAS.

Lent by Sir Frederick Leighton, Bart., P.R.A.

337. BUBBLES.

Lent by Messrs. Pears.

Miller, P. H., *8 Gloucester Mansions, Harrington Gardens, London.*

338. THE OLD ARM CHAIR.

"I love it, I love it, and who shall dare
To chide me for loving that old arm chair."

Eliza Cook.

Millet, F. D., *Broadway, Worcestershire.*

339. HOW THE GOSSIP GREW.

Lent by Robert Dunthorne, Esq.

Montalba, Miss Clara, R.W.S., *Palazzo Trevisan 809 Campo S. Agnese, Venice.*

340. A THAMES BARGE OFF CHELSEA

Moore, Albert, *2 Spencer Street, Westminster, London.*

341. A REVERIE.

Lent by Henry Moore, Esq., A.R.A.

Moore, Henry, A.R.A., 39 Maresfield Gardens, Hampstead, London.

342. STORM BREWING.

343. ST. ALBAN'S RACE.

344. SUNSET AFTER A STORM.

Morgan, Fred, 7 North Bank, Regent's Park, London.

345. THE FAVOURED SWAIN.

Morris, P. R., A.R.A., 33 St. John's Wood Road, London.

346. SONS OF THE BRAVE.

Duke of York's School for Soldiers' Orphan Boys.
Lent by James Dole, Esq.

347. FÊTE DIEU, DIEPPE, NORMANDY.

Lent by Franklin Browne, Esq.

348. EDWARD I. DEMANDING THE OATH OF ALLEGIANCE TO
THE FIRST PRINCE OF WALES.

Moscheles, Felix, care of W. J. Stacey, 28 Old Bond Street, London.

349. RECITER IN AN ARAB CAFÉ, CAIRO.

Mottram, C. S., 110 South Hill Park, Hampstead, London.

350. A WINTER SEA ON THE YORKSHIRE COAST, MORNING.

Moynau, R. T., R.H.A., 6 Effra Road, Rathmines, Dublin.

351. MILITARY MANŒUVRES.

Murray, David, A.R.A., 1 Langham Chambers, Portland Place, London.

352. THE RIVER ROAD.

Lent by George McCulloch, Esq.

353. A MANGOLD FIELD.

Lent by George McCulloch, Esq.

354. SEASON OF MISTS AND MELLOW FRUITFULNESS.

Nicol, J. Watson, *Park Cottage, Pelham Street, South Kensington.*

355. "THE GOOD OLD RULE, THE SIMPLE PLAN,
THAT THEY SHOULD TAKE WHO HAVE THE POWER,
AND THEY SHOULD KEEP WHO CAN."

Noble, Robert, *East Linton, Prestonkirk, Haddingtonshire, N.B.*

356. SEPTEMBER.

Normand, Ernest, *Rowsley House, Holland Park Road, Kensington, London.*

357. DEATH OF PHARAOH'S FIRST-BORN.

Norris, H. L., *23 Clairville Grove, Kensington, London.*

358. TWILIGHT.

North, J. W., R.W.S., *Beggearnhuish House, Washford, Taunton.*

359. "SEEST HOW FRESH MY FLOWERS BE SPREAD,
IN LILY-WHITE AND CRIMSON RED."—*Spenser.*

Lent by **Colonel North.**

Olivier, Herbert A., *2 Queen's Road Studios, London.*

360. PORTRAIT OF THE VENERABLE ARCHDEACON FARRAR.
Presentation portrait.

Lent by **The Ven. Archdeacon Farrar, D.D.**

Orchardson, W. R., R.A., *13 Portland Place, London.*

361. A PORTRAIT GROUP.

Osborn, Miss E. M., *10a Cunningham Place, London.*

362. SUMMER SHROUD.

"When nature's dying face is veiled."

Osborne, Walter, R.H.A., *5 Castlewood Avenue, Rathmines, Dublin.*

363. THE FERRY.

Oules, W. W., R.A., 12 *Bryanston Square, London.*

364. PORTRAIT OF T. S. COOPER, ESQ., R.A.

Lent by T. S. Cooper, Esq., R.A.

365. PORTRAIT OF SIR DONALD SMITH, K.C.M.G.

Chairman of the Hudson Bay Co.

Lent by Sir Donald Smith.

Overend, W. H., 17 *Southampton Street, Fitzroy Square, London.*

366. "VICTORY!"—THE PRIZE CREW TAKING POSSESSION.

Palin, W. M., *Ormond Cottage, Milford, Surrey.*

367. ORPHANS.

Parker, John, R.W.S., 5 *Melina Place, Grove End Road, St. John's Wood.*

368. COCKLE GATHERERS.

Parsons, Alfred, R.I., *care of C. M. May, 19 St. Ann's Court, Soho, London.*

369. IN A CIDER COUNTRY.

370. THE FLOWERS APPEAR ON THE EARTH.

371. "THE VOICE OF THE TURTLE IS HEARD IN THE GROVE."

372. THE DAYLIGHT DIES.

Parton, Ernest, 35 *Acacia Road, Regent's Park, London.*

373. WHEN DAYLIGHT DIES.

374. MISTY MORN.

Lent by Arthur Hill, Esq.

375. THE NIGHT FERRY.

Pash, Miss Florence, 132 *Sloane Street, London.*

376. OVER THE WAY.

Peppercorn, A. N., *West Horsley, Leatherhead, Surrey.*

377. THE CORNFIELD.

378. A SURREY VILLAGE.

Perugini, Mrs. Kate, *38a Victoria Road, Kensington, London.*

379. TOMBOY.

Lent by **John Brickwood, Esq.**

380. HAPPY AND CARELESS.

Lent by **Mrs. Mackie.**

Perugini, C. E., *38a Victoria Road, Kensington, London.*

381. CROSSING THE TORRENT.

382. A SUMMER SHOWER.

383. CLARE.

Pettie, John, R.A. (the late), *2 Fitzjohn's Avenue, London.*

384. THE TRAITOR.

385. SILVIA.

386. MONMOUTH PLEADING FOR HIS LIFE BEFORE JAMES II.

Lent by **Messrs. Thomas Agnew & Sons.**

387. BONNY PRINCE CHARLIE.

Phillips, Laurence B., R.P.E., *Chesham House, 134 Sutherland Avenue, London.*

388. A MILL IN KENT.

Pickering, J. L., *Hogarth Club, 36 Dover Street, London.*

389. AN AUTUMN GUST.

390. AN OLD WORLD HOME.

Poole, P. F., R.A. (the late).

391. THE PRODIGAL SON.

Lent by **James Leathart, Esq.**

392. GREEK EXILES.

Lent by **David Jardine, Esq.**

Poynter, E. G., R.A., 28 *Albert Gate, Knightsbridge, London.*

393. UNDER THE SEA WALL.

Lent by W. Cuthbert Quilter, Esq., M.P.

394. ON THE TERRACE.

Lent by Max Waechter, Esq.

395. DIADUMENÉ.

Greek woman, binding her hair preparatory to the bath.

396. WHITE ROSES.

Price, J. M., 12 *Glasshouse Street, Piccadilly, London.*

397. VIATICUM.

Prinsep, Val C., A.R.A., 1 *Holland Park Road, Kensington, London.*

398. THE BROKEN IDOL.

A Christian slave, who in his religious zeal has broken one of the family gods, is brought as an amusement before his mistress, a Roman lady of the time of Diocletian, to explain his conduct. He is under the charge of the vicarius (master of the slaves), and is attended by his fellow Christians.

Pyne, Thomas, R.I., 3 *Royal Square, Dedham, Colchester, Essex.*

399. STREATLEY HILL ON THE THAMES.

Radford, Edward, A.R.W.S., 10 *Margravine Gardens, West Kensington, London.*

400. WEARY.

Lent by H.R.H. The Duchess of Albany.

Rae, Iso., 13 *Rue Le Verrier, Paris.*

401. A LITTLE PEASANT.

Rae, Henrietta (Mrs. E. Normand), *Rowsley House, Holland Park Road, Kensington, London.*

402. LA CIGALE.

403. DOUBTS.

Rattray, Wellwood, R.S.A., 247 *West George Street, Glasgow.*

404. GOLDEN OCTOBER ON THE FORTH.

405. SUMMER EVE, KINTYRE.

Lent by **R. Derby Anderson, Esq.**

Reed, George Ogilvie, R.S.A., 15 *Shandwick Place, Edinburgh.*

406. THE STROLLER'S TALE.

Reid, Miss Flora M., 62 *Park Road, Haverstock Hill, London.*

407. HUSH!

Lent by **A. W. Barradale, Esq.**

408. IN THE MARKET PLACE.

Reid, John R., 62 *Park Road, Haverstock Hill, London.*

409. THE MATE OF THE "MERMAID'S WEDDING."

410. THE YARN.

Lent by **J. S. Forbes, Esq.**

Riviere, Briton, R.A., 82 *Finchley Road, London.*

411. REQUIESCAT.

412. DANIEL.

Lent by **Thomas H. Ismay, Esq.**

413. THE MAGICIAN'S DOORWAY.

Lent by **W. Cuthbert Quilter, Esq., M.P.**

Robertson, Henry Robert, 1 *Steele's Studios, Haverstock Hill, London.*

414. "THE PLOUGHMAN HOMEWARD PLODS HIS WEARY WAY."

Rooke, T. M., 7 *Queen Anne's Gardens, Bedford Park, London.*

415. KING AHAB'S COVETING.

Lent by **Merton Russell Cotes, Esq., F.R.G.S.**

416. JUDITH'S ADVENTURING.

Sadler, W. Dendy, 28 *Finchley Road, London.*

417. DARBY AND JOAN.

Lent by John Ashby, Esq.

418. LEA ROACHERS.

Lent by H. L. Lefèvre, Esq.

Sant, James, R.A., 43 *Lancaster Gate, London.*

419. OLIVER TWIST.

“He walks to London” (Chap. viii.).

420. MY LADY DOROTHY.

Schloesser, Carl, 1 *Primrose Hill Studios, London.*

421. MOLIÈRE READING TO HIS SERVANT “LA FORET.”

Schmalz, Herbert, *The Studios, Holland Park Road, Kensington, London.*

422. CHRISTIANÆ AD LEONES.

“The sect who were first called Christians in Antioch had that day borne good witness to their faith in Rome. The grim work was over for the strong; only the tenderest, the most innocent, saved from that death they envied for a crueller fate, had been borne to the circus with ribald jest and vile indignity. In the fierce glare of the arena waiting for the end,—waiting there under the pitiless eyes of the populace, from senator and patrician dame, to low buffoon and parasite, weary of slaughter but insatiate for further blood,—waiting till fear was lost in hope, and shame grew shameless, before the presence of death.”

423. TOPSY.

Schmiechen, H., 7 *Cromwell Place, South Kensington.*

424. PORTRAIT OF MRS. BLOOMFIELD MOORE.

Shannon, J. J., *Alexander Studios, Alfred Place, South Kensington.*

425. PORTRAIT OF MRS. HITCHCOCK.

426. PORTRAIT OF G. HITCHCOCK, Esq.

Lent by G. Hitchcock, Esq.

427. PORTRAIT OF MRS. CHARLESWORTH.

Small, William, R.I., 294 Camden Road, London.

428. LOVE LAUGHS AT RAIN.

429. RETURNING FROM MARKET, CONNEMARA : ROUGH ON BIDDY.

Smallfield, Frederick, R.W.S., 52 Boundary Road, St. John's Wood, London.

430. COLONEL NEWCOME IN CHARTERHOUSE : GRACE AFTER MEAT.

Smart, John, R.S.A., 13 Brunswick Street, Edinburgh.

431. A GLEN WITHOUT A NAME, BEN CRUACHAN.

Smythe, Lionel, P., 36 Dover Street, London, W.

432. BOULOGNE SHRIMPERS.

Lent by Sir George Findlay.

433. HARVEST OF THE SEA, BOULOGNE.

Lent by Sir George Findlay.

Solomon, Solomon J., 2 St. John's Wood Studios, London.

434. ORPHEUS.

Stacey, Walter S., Hillcote, Cannon Place, Hampstead, London.

435. ROUGH COURTING.

Starling, Albert, 18 Fitzroy Street, London, W.

436. SAVED FROM THE SEA.

Lent by Charles Lucas, Esq.

Steer, P. Wilson, Maclise Mansions, Addison Road Station, London.

437. BATHERS.

438. THE SOFA.

Stephens, W. R., 33 St. Leonard's Terrace, Chelsea, London.

439. SUMMER.

Stokes, Adrian, 27 *Avonmore Road, West Kensington, London.*

440. THE SETTING SUN.

Lent by George McCulloch, Esq.

441. THROUGH THE MORNING MIST.

442. ROMAN CAMPAGNA, SUNSET.

443. EARLY SPRING, ROMAN CAMPAGNA.

Stokes, Mrs. Adrian, 27 *Avonmore Road, West Kensington, London.*

444. HAIL, MARY.

445. "GO; THOU MUST PLAY ALONE, MY BOY."

Lent by Mrs. P. Hearst.

Stone, Marcus, R. A., 8 *Melbury Road, Kensington, London.*

446. THE GAMBLER'S WIFE.

Lent by George McCulloch, Esq.

447. THE PASSING CLOUD.

Lent by Arthur Lucas, Esq.

448. TWO'S COMPANY, THREE'S NONE.

Lent by Messrs. Frost and Reed.

Storey, G. A., A.R.A., 39 *Broadhurst Gardens, South Hampstead, London.*

449. THE PADRE, A SPANISH INTERIOR.

Stott, Edward, *Amberley, Sussex.*

450. PEACEFUL EVENING.

Lent by Andrew Muir, Esq.

451. THE BATHERS.

Lent by John Maddocks, Esq.

452. THE HORSE POND.

Lent by John Maddocks, Esq.

453. IN AN ORCHARD.

Stott, William (of Oldham), 66 *Adelaide Road, London.*

454. KISSING-RING.

Swan, John M., 3 *Acacia Road, St. John's Wood, London.*

455. THE FALLEN MONARCH.

456. MATERNITY.

Lent by the Hon. C. N. Lawrence.

Swan, Mrs., 3 *Acacia Road, St. John's Wood, London.*

457. THE CHORISTER.

458. THE DUET.

Swynnerton, Mrs. Annie L., *The Avenue, 76 Fulham Road, London.*

459. MATER TRIUMPHALES.

460. PORTRAIT OF MISS JANE ATKINSON.

Symonds, W. R., *The Studio, Holland Park Road, Kensington.*

461. MIGNON.

Symons, W. Christian, *Mayfield, Sussex.*

462. THE FIGURE HEAD OF THE CUPID.

Lent by R. Le Brasseur, Esq.

463. DIANA AND ENDYMION.

Lent by R. Le Brasseur, Esq.

Tayler, A. Chevallier, 27 *Great James Street, Bedford Row, London.*

464. THE ENCORE—"HOME, SWEET HOME."

465. THE PEDLAR.

Thomson, Leslie, 76 *Charlotte Street, Fitzroy Square, London.*

466. THE HOMELESS SEA.

Thornley, Charles, *Hadleigh Lodge, East Moulsey, Surrey.*

467. DUTCH FISHING BOAT.

Titcomb, William Holt Yates, *Ockham House, Culverden Road, Balham.*

468. PRIMITIVE METHODISTS, ST. IVES, CORNWALL.

469. OLD SEA DOGS.

Topham, Frank W. W., R.I., *Garden Chambers, 32 Great Ormond Street, London.*

470. NAAMAN'S WIFE.—II. Kings v. 1-2.

Lent by Sir Robert Romer.

Tuke, Henry S., *Lyndon Lodge, Hanwell, Middlesex.*

471. SAILORS PLAYING CARDS.

Walker, J. Hanson, *88 Kensington Park Road, London.*

472. A PORTRAIT—"MAY."

473. MRS. FRANK GRIMWOOD, OF MANIPUR.

Walker, Francis S., R.H.A., *1 England Lane, Haverstock Hill, London.*

474. THE CONVENT GARDEN.

Lent by The Corporation of Leeds.

Waller, Mrs. Mary L., *58 Circus Road, St. John's Wood, London.*

475. THE CARD DEALER.

Lent by W. B. Readhead, Esq.

Waller, S. E., *Arts Club, Hanover Square, London.*

476. ONE-AND-TWENTY.

Lent by George McCulloch, Esq.

477. THE EMPTY SADDLE.

Lent by O. Ll. J. Evans, Esq.

Walton, E. A., A.R.S.A., 203 Bath Street, Glasgow.

478. GIRL IN BROWN.

Walton, Frank, R.I., Holmbury St. Mary, Dorking.

479. WRECK OF SPANISH ARMADA SHIPS.

Ward, Mrs. E. M., 3 Chester Houses, Chester Square, London.

480. MRS. FRY VISITING NEWGATE IN 1818.

481. THE UGLY DUCKLING.

From Hans Andersen's Fairy-tales.

Waterhouse, J. W., A.R.A., 6 Primrose Hill Studios, Fitzroy Road, London.

482. MARIAMNE LEAVING THE PRAETORIUM.

Lent by W. Cuthbert Quilter, Esq., M.P.

Waterlow, Ernest A., A.R.A., 1 Maresfield Gardens, London.

483. OVER THE SANDHILLS, BRISTOL CHANNEL.

484. THE MISTY MOON, ISLE OF ARRAN.

485. THE NIGHT BEFORE SHEARING.

Watts, G. F., R.A., Little Holland House, Kensington, London.

486. LOVE AND LIFE.

487. LOVE AND DEATH.

488. PAOLO AND FRANCESCA.

489. THE GENIUS OF GREEK POETRY.

490. PORTRAIT OF ROBERT BROWNING.

491. PORTRAIT OF WALTER CRANE.

Weguelin, J. R., 3 Stratford Avenue, Kensington, London.

492. THE MAIDENS' RACE.

Lent by The Earl of Eldon.

Wehrschmidt, Daniel A., *Cleveland, Bushey, Herts.*

493. "FINDING THE HEAD OF ORPHEUS."

"When the Thracian women tore Orpheus in pieces, it is said that his head, together with his lyre, fell into the river Hebrus, and that the head floated on the lyre, while the former sang in lamentation over Orpheus, and the latter echoed the song as the breezes swept the chords. And so both were wafted, amid the sounds of music, to Lesbos, where the Lesbians took up the head and buried it on the spot where their Temple of Bacchus now stands."—*Lucian.*

Wetherbee, G., *37 Steele's Road, Haverstock Hill, London.*

494. FISHERMEN'S WIVES.

Lent by Tom Mitchell, Esq.

495. GLAD SPRING.

White, John, *Branscombe, Axminster, Devon.*

496. OUR VILLAGE.

Lent by John Ure, Esq.

497. BEER HEAD, DEVON.

Lent by E. Homan, Esq.

Wilkinson, Hugh, *Oak House, Brockenhurst, Hampshire.*

498. A CLOUDY MORNING.

Williams, Alexander, A.R.A., *4 Hatch Street, Dublin.*

499. THE PORT OF DUBLIN—SUNSET.

Wirgman, T. Blake, *24 Dawson Place, London.*

500. PORTRAIT OF MISS APPLIN.

501. A PORTRAIT—MRS. WIRGMAN.

Wood, Miss E. Stewart, *44 Holland Street, Kensington, London.*

502. AUTUMN.

Woods, Henry, A.R.A., *Calle del Dosedà Ponte, 2727 San Maurizio, Venice, Italy.*

503. STEPS OF THE SCUOLA SAN ROCCO.

Lent by **Stephen G. Holland, Esq.**

Wortley, Archibald Stuart, *62 Westbourne Terrace, Hyde Park, London.*

504. MRS. H. GRENVILLE WELLS.

505. MISS MAUD WALLER.

506. MISS CLARE DAVIES.

Wright, Miss E., *8 Elm Tree Road, St. John's Wood, London*

507. PIERRETTE ENCROYABLE.

Wyllie, W. L., A.R.A., *Hoo Lodge, near Rochester, Kent.*

508. THE GERMAN EMPEROR AND PRINCE OF WALES INSPECTING THE WHITE STAR STEAMER "TEUTONIC" AT SPITHEAD, 4TH AUGUST, 1889.

Lent by **T. H. Ismay, Esq.**

509. ORIENT LINER "ORMUZ" OFF THE EDDYSTONE.

Lent by **Messrs. Anderson & Co.**

510. THE PORT OF LONDON.

Lent by **The Fine Art Society.**

511. DAVY JONES'S LOCKER.

Wyllie, Charles W., *38 Abercorn Place, St. John's Wood, London.*

512. THE BRIMMING RIVER.

513. THE MIGHTY FALLEN.

Lent by **S. N. Castle, Esq.**

Yeames, William, F.R.A., *4 Grove End Road, London.*

514. PRISONERS OF WAR. 1805.

GROUP CXLI.

PAINTINGS IN WATER-COLOURS.

Allan, Robert W., R.W.S., 10 Boscobel Place, Alpha Road,
London.

515. LOCH RANZA, ARRAN.

516. GWALIOR, INDIA.

Allingham, Mrs., R.W.S., Eldon House, Lyndhurst Road,
Hampstead, London.

517. THE SICK DUCKLING.

Alma-Tadema, L., R.A., 17 Grove End Road, London.

518. CALLING THE WORSHIPPERS.

Alma-Tadema, Miss Anna, 17 Grove End Road, St. John's
Wood, London.

519. THE DRAWING ROOM, TOWNSHEND HOUSE.

Aumonier, J., R.I., 115 Gower Street, London.

520. OLD SHOREHAM, SUSSEX.

Bayliss, Wyke, P.R.B.A., North Road, Clapham Park, London.

521. INTERIOR OF WESTMINSTER ABBEY.

Becker, H., *The Minorities, All Saints'*, Colchester.

522. THE MOWER.

Brewtnall, Edward F., R.W.S., 12 Bedford Gardens, Campden
Hill, London.

523. CHRISTIAN AND EVANGELIST.

524. THE DRAGON'S CAVE.

Brierly, Sir Oswald, W., R.W.S., 8 Ormonde Terrace, London.

525. H.R.H. THE PRINCE OF WALES' R.Y.S. YACHT "ALINE,"
manœuvring the Royal Yacht Squadron at Cowes,
August, 1885.

Lent by H.R.H. The Prince of Wales.

526. H.R.H. THE PRINCE OF WALES COMMODORE OF THE ROYAL
YACHT SQUADRON AND THE ROYAL THAMES YACHT
CLUB, STARTING THE OCEAN YACHT RACE ROUND THE
UNITED KINGDOM FROM SOUTHEND, JUNE 14, 1887.

Lent by H.R.H. The Prince of Wales.

527. H.M.S. "BLACK PRINCE" (Capt. H.R.H. the Duke of
Edinburgh).

Lent by H.R.H. The Duke of Edinburgh.

Buckman, Edwin, A.R.W.S., care of Miss Smith, 4 Alexander
Square, South Kensington, London.

528. PREPARING ORANGES FOR THE PACKERS, ANDALUSIA.

Bulleid, G. Lawrence, A.R.W.S., Magdalen House, Glastonbury
Somerset.

529. IN DOUBT.

530. A CUSTODIAN.

531. AT THE TEMPLE GATE.

Callow, William, R.W.S., F.R.G.S., The Firs, Great Missenden
Bucks.

532. ON THE LAKE OF COMO, LOOKING TOWARDS MENAGGIO.

Collier, Thomas, R.I. (the late).

533. TWO GREEN ROADS.

Lent by James Orrock, Esq., R.I.

Coutts, H., Windermere.

534. A SHEEP-FARM IN THE DUDDON.

Crane, Walter, 13 Holland Street, Kensington, London.

535. CHURCH OF RIEVAULX ABBEY.

536. REFECTORY, RIEVAULX ABBEY.

Dadd, Frank, R.I., *Wilton House, Hyde Vale, Blackheath, Kent.*

537. THE CAPTAIN OF THE TROOP.

Dealy, Miss Jane M., R.I., *Walton Lodge, Blackheath, Kent.*

538. A FRESH BREEZE AND AWAY.

539. "ONE FOOT UP AND ONE FOOT DOWN,
THAT'S THE WAY TO LONDON TOWN."

Dillon, Frank, R.I., *13 Upper Phillimore Gardens, London.*

540. THE TEMPLE OF GERTASSEÉ, NUBIA.

Dobson, W. C. T., R.A., R.W.S., *Lodsworth, Petworth, Sussex.*

541. ADA WITH THE GOLDEN HAIR.

Lent by W. Howard, Esq.

542. SUMMER ROSES.

Lent by L. Blumfeld, Esq.

Duffield, Mrs. William, R.I., *33 Elgin Crescent, Notting Hill, London.*

543. JAPANESE ROSES.

Du Maurier, George, *New Grove House, Hampstead, London.*

544. TIME'S REVENGE.

Earle, Charles, *9 Duke Street, Portland Place, London.*

545. EVENING IN THE FORUM AT ROME.

546. ARANCE DOLCE AMALFI.

East, Alfred, R.I., *4 Grove End Road, St. John's Wood, London.*

547. EARLY NIGHT.

548. NORTHAMPTON.

Elgood, George S., R.I., 8 *The Crescent, Leicester.*

549. COMPTON WYNNYATES.

Lent by **J. H. Whatford, Esq.**

550. "DOWN WHERE THE GARDEN GROWS

GAY AS A BANNER."

Lent by **W. Baldwin, Esq.**

551. SUNFLOWERS.

Lent by **E. C. A. Leigh, Esq.**

Ellis, Tristram, 8 *Trevor Terrace, Knightsbridge, London.*

552. THE ACROPOLIS, ATHENS, FROM THE HILL OF THE
NYMPHS.

Evershed, Arthur, A.R.P.E., 29 *Rosslyn Hill, Hampstead, London.*

553. THE QUAY, BAWDSEY, SUFFOLK.

554. AN ESSEX BARN.

Foster, Birket, R.W.S., *The Hill, Witley, Surrey.*

555. BEN NEVIS.

Lent by **John H. Foster, Esq.**

Fowler, Robert, R.I., 10 *South Castle Street, Liverpool.*

556. THE TEMPEST.

Lent by **Joseph Duckworth, Esq.**

557. THE WITCH OF ATLAS.

Fripp, Charles E., A.R.W.S., *The Studio, 192 Haverstock Hill, London.*

558. STEPS OF KURODANI TEMPLE ON A FÊTE DAY, JAPAN.

559. AFTERNOON IN A JAPANESE VILLAGE.

560. SHRINE AT SETA, JAPAN—AFTER RAIN.

Fulleylove, John, R.I., 50 *Great Russell Street, London.*

561. HAMPTON COURT PALACE.

Lent by John Carbery Evans, Esq.

562. MAGDALEN TOWER AND BRIDGE, OXFORD.

Lent by Gaspard Farrer, Esq.

Gilbert, Sir John, R.A., *Vanbrugh Park Road West, Blackheath, Kent.*

563. RICHARD II. RESIGNING THE CROWN TO BOLINGBROKE.

Lent by W. Y. Baker, Esq.

564. CONSPIRACY.

Lent by Edward Priestman, Esq.

Goodall, Edward A., R.W.S., 57 *Fitzroy Road, Regent's Park Road, London.*

565. INTERIOR OF THE MOSQUE OF SULTAN HASSAN, CAIRO.

566. BAB ZOOÁLEH, ONE OF THE GATES OF CAIRO.

Gotch, T. C., 70 *Gower Street, London.*

567. A LETTER FROM AMERICA.

Gow, Andrew C., R.A., 15 *Grove End Road, London.*

568. REQUISITIONISTS.

Lent by W. Cuthbert Quilter, Esq., M.P.

Gow, Miss Mary L., 15 *Grove End Road, London.*

569. THE STORY OF THE WILLOW PATTERN.

570. BEGGAR MY NEIGHBOUR.

Lent by Messrs. J. & W. Vokins.

Grace, A. F., *Chantrey Green House, Steyning, Sussex.*

571. MAYTIME ON DOWNS, ISLE OF WIGHT. PORTSMOUTH IN DISTANCE.

572. OLD FARM HOUSE, SUSSEX.

Green, C., R.I., *Charlecote, Hampstead Hill Gardens, London.*

573. NEIL AND HER GRANDFATHER.

Lent by **William Lockwood, Esq.**

574. THE PICKWICK CLUB.

Lent by **William Lockwood, Esq.**

These Drawings form part of a series of 14 subjects from Charles Dickens, painted for Mr. Lockwood.

Green, Towneley, R.I., *Charlecote, Hampstead Hill Gardens London.*

575. A WAY THEY HAVE IN THE ARMY.

Greenaway, Miss Kate, *50 Frognal, Hampstead, London.*

576. TITLE-PAGE, "MARIGOLD GARDENS."

577. LITTLE PHILLIS, "MARIGOLD GARDENS."

578. MY LITTLE GIRLIE, "MARIGOLD GARDENS."

579. MULBERRY BUSH, "CHILDREN'S GAMES."

580. GAME PLAY, "HYACINTH'S LANGUAGE OF FLOWERS."

581. GIRL DRAWING CHAISE WITH TWO CHILDREN.

Gregory, Charles, R.W.S., *Bridgefoot House, Ripley, Surrey.*

582. LUTHER'S ABSTRACTION.

"When writing his 'Commentary on the 22nd Psalm he shut himself up for three days, with nothing but bread and salt; until, at last, his wife had to send for a locksmith to break open the door, when they found him absorbed in meditation."

583. THE SORCERER.

584. IN WINCHESTER.

Haag, Carl, R.W.S., *Ida Villa, 7 Lyndhurst Road, Hampstead, London.*

585. ONE OF OUR ANCESTORS.

586. A DRUIDICAL NOVICE.

587. A BRIDAL PROCESSION AT DAMASCUS.

588. THE SCHÖNE BRUNNEN AT THE MARKET PLACE OF
NÜRNBERG.

Hague, Anderson, R.I., *Deganway, Llandudno, Wales.*

589. WINTER.

Lent by Robert F. Riddick, Esq.

Hall, Oliver, R.P.E., 74 *Tulse Hill, London.*

590. THE DUDDON VALLEY FROM ABOVE LEATHWAITE.

591. A WINDY DAY.

Hargitt, Edward, R.I., 1 *Gladstone Villas, South View, Basing-
stoke, Hants.*

592. THE UNDERCLIFF, ISLE OF WIGHT.

593. ERIDGE PARK, KENT.

Hatherell, W., R.I., 11 *Elm Grove, Cricklewood, London.*

594. QUARTER DECK OF A P. AND O. STEAMER.

595. MONACO AND MONTE CARLO, FROM ROQUEBRUNE.

Hayes, Claude, *The Cottage, Woburn Park, Addlestone, Surrey.*

596. MOONRISE.

Hayes, Edwin, R.H.A., R.I., *Olive Villa, Quex Road, West
Hampstead, London.*

597. FISHING SMACK LEAVING PORT.

Henshall, J. Henry, R.W.S., 34 *Broadhurst Gardens, South
Hampstead, London.*

598. "MERRY GOES THE TIME WHEN THE HEART IS YOUNG."

Lent by John Carbery Evans, Esq.

599. IN WONDERLAND.

Lent by The Corporation of Birmingham.

Hine, Harry, *St. Albans, Hertfordshire.*

600. DURHAM: THE CASTLE, TOWN, AND CATHEDRAL.

601. LINCOLN.

Hine, Henry George, V.P.R.I., *Eland House, Rosslyn Hill, Hampstead, London.*

602. DURLESTONE HEAD, DORSETSHIRE.

Lent by **Joseph King, Junr., Esq.**

Hodson, Samuel J., R.W.S., 7, *Hillmarton Road, Camden Road, London.*

603. PIAZZA DEI SIGNOI, VERONA.

604. CORNER OF THE DUCALE, VENICE.

605. CORDO, VERONA.

Holiday, Henry, *Oak Tree House, Branch Hill, Hampstead, London.*

606. SUNSET AND MOONLIGHT ON THE ATLANTIC.

Hopkins, Arthur, A.R.W.S., 80 *Finchley Road, London.*

607. OUTWARD BOUND.

608. SATURDAY EVENING ON THE QUAY.

Hunt, Alfred W., R.W.S., 1 *Tor Villas, Campden Hill, London.*

609. SUMMER SUNSHINE, CAPEL CURIG.

Lent by **W. S. Caine, Esq., M.P.**

610. A NOVEMBER RAINBOW.

Lent by **W. S. Caine, Esq., M.P.**

611. ROBIN HOOD'S BAY, NORTH YORKSHIRE COAST.

Lent by **W. S. Caine, Esq., M.P.**

612. 'TWIXT SEA AND LAND, NORTH WALES.

Lent by **W. S. Caine, Esq., M.P.**

Johnson, Cyrus, 21 *Devonshire Street, Portland Place, London.*

613. THE SUN INN, DEDHAM.

Kilburne, G. Goodwin, 50 *Dennington Park Road, West Hampstead, London.*

614. GOOD ACCOMMODATION FOR MAN AND BEAST,

615. A DIFFICULTY.

Knight, Joseph, R.I., *Maesdola House, Llan-Rhos, near Llan-dudno, Wales.*

616. TWILIGHT.

Lent by Col. W. W. Mawson.

Lamont, T. R., R.I., 19 *North Bank, Regent's Park, London.*

617. THE END OF THE PROLOGUE.

Langley, Walter, R.I., *Newlyn, Penzance.*

618. DISASTER.

Lent by J. C. Holder, Esq.

619. DEPARTURE OF THE FLEET.

Lent by David Hedges, Esq.

Linton, Sir James D., P.R.I., 5 *Cromwell Place, South Kensington, London.*

620. ABANDONED.

Lent by J. T. Wigzell, Esq.

Lloyd, Tom, R.W.S., 5 *Adelaide Road, Hampstead, London.*

621. FERRY BOAT, AHoy !

Lent by F. H. Woodroffe, Esq.

622. THE LAST LOAD.

Lent by Charles Maw, Esq.

Macallum, Hamilton, R.I., *Wychcombe Studios, Haverstock Hill, London.*

623. A CAPRI BOY.

Lent by **E. Homan, Esq.**

624. CAUGHT BY THE TIDE.

Lent by **E. Homan, Esq.**

Macquoid, Percy, R.I., *Yellow House, 8 Palace Court, Bayswater, London.*

625. EXCOMMUNICATED.

Macquoid, Thomas R., R.I., *The Edge, Tooting Common, London.*

626. AT KAMPEN, HOLLAND.

627. WATER CARRIERS, SPAIN.

628. IN MERCIA, SPAIN.

Marrable, Mrs., *60 Cleveland Square, Hyde Park, London.*

629. OLD CEDAR TREES, BOYLE FARM, THAMES DITTON, SURREY.

630. VAL DE FEX, ENGADINE, SWITZERLAND.

631. PIAZZA COMUNALE NEBBIOLO, LAGO DI COMO.

Martineau, Miss Edith, A.R.W.S., *35 Gordon Square, London*

632. IN SWEET MUSIC.

633. HER FAVOURITE DOLL.

634. SHELLING PEAS.

McGuinness, Bingham, R.H.A., *7 St. Stephen's Green, Dublin.*

635. KILCHURN CASTLE, LOCH AWE.

636. HANGMAN'S BRIDGE, NUREMBERG.

Moore, Henry, A.R.A., *39 Maresfield Gardens, Hampstead, London.*

637. BRIGHT MORNING AFTER A BREEZE.

638. SCHEVENINGEN: WAITING FOR THE SHRIMP BOATS.

Montalba, Miss Clara, R.W.S., *Palazza Trevisan, 809 Campo S. Agnese, Venice.*

639. ST. MARK'S, VENICE.

640. A VENETIAN FERRY.

641. AFTER A STORM, VENICE.

Murray, David, A.R.A., A.R.W.S., 1 *Langham Chambers, Portland Place, London.*

642. HAYFIELD.

Lent by Col. W. W. Pilkington.

Nash, Joseph, R.I., 36 *The Avenue, Bedford Park, Chiswick.*

643. A WINTER MORNING.

644. A WINTER SUNSET, BEN NEVIS.

645. THE HAUNTED CHAMBER.

646. AFTER THE GALE.

Nisbet, R. B., 11A *Shandwick Place, Edinburgh.*

647. A BORDERLAND SUNSET.

Norman, Philip, 45 *Evelyn Gardens, South Kensington, London.*

648. COURTYARD OF THE WHITE HART INN (now destroyed).

649. INTERIOR OF BARNARD'S INN, HOLBORN (now dismantled).

650. THE COURTYARD OF THE GEORGE INN, SOUTHWARK.

Orrock, James, R.I., 48 *Bedford Square, London.*

651. CARDROSS MOSS, PERTSHIRE.

Lent by Alderman Boothroyd.

652. ROUGH SEA OFF THE ISLE OF ARRAN.

Lent by John Crossfield, Esq.

Parker, John, R.W.S., 5 *Melina Place, Grove End Road, London.*

653. THE VILLAGE RENDEZVOUS.

Parsons, Alfred, R.I., care of C. M. May, 19 St. Ann's Court,
Soho, London.

654. BODENHAM CHURCH.

655. SOMERSETSHIRE HILLS.

Phillip, Colin B., A.R.W.S., Studios, 20 Fitzroy Street, London.

656. EVENING IN THE GLEN.

657. A SUMMER DAY, LOCH ETIVE, ARGYLLSHIRE, N.B.

Pilleau, H., R.I., 30 Kensington Court Mansions, London.

658. AMALFI, SOUTH ITALY.

659. ENTRANCE TO THE DUCAL PALACE, VENICE.

Pilsbury, Wilmot, Porlock, Taunton, Somersetshire.

660. AN OLD VILLAGE CROSS.

661. A DUCKPOOL.

662. A FARMSTEAD.

Poynter, E. J., R.A., R.W.S., 28 Albert Gate, London, S.W.

663. IN A GARDEN.

Radford, Edward, A.R.W.S., 10 Margravine Gardens, West
Kensington, London.

664. NAUSICAA.

Lent by S. K. Muspratt, Esq.

665. EROS.

Lent by William Croxford, Esq.

666. HERO.

Lent by William Croxford, Esq.

Rainey, W., Fishbourne, Chichester, Sussex.

667. THE OLD VRONN.

668. THE CITY WALL.

Rigby, Cuthbert, A.R.W.S., 21 *Greenside, Kendal.*

669. AN OCTOBER FLOOD.

Lent by Theo. R. Fothergill, Esq.

670. SUMMER DAYS.

671. THE FELS ABOVE CONISTON.

Lent by C. T. Arnold, Esq.

Richardson, John I., R.I., 21 *Notting Hill Square, London.*

672. SNOWSTORM IN GLENCO.

Lent by J. Carbery Evans, Esq.

673. CARTING FAGGOTS, SUSSEX.

Rivers, Leopold, 2 *Darenth Road, Stamford Hill, London.*

674. HARVEST HOME.

Robertson, Arthur, 146 *Portsdown Row, Maida Vale, London.*

675. MINERVA.

Rooke, T. M., 7 *Queen Anne's Gardens, Bedford Park, London.*

676. NORTH TRANSEPT, TROYES CATHEDRAL.

Severn Arthur, R.I., *Herne Hill.*

677. FLORENCE, FROM SAN MINIATO.

678. WAVES BREAKING, NEAR KILKEE, WEST COAST OF IRELAND.

Smallfield, Frederick, R.W.S., 52 *Boundary Road, St. John's Wood.*

679. THE VELVET HAT

680. PRATO, TUSCANY, THE RINGHIERA OF DONATELLO OUTSIDE THE DUOMO.

Smith, Carlton A., R.I., 72 *Park Road, Haverstock Hill, London.*

681. A CORNER OF THE STUDIO.

"Oh! woman, in our hours of ease,
Uncertain, coy, and hard to please."

Smythe, Lionel P., 36 *Dover Street, London, W.*

682. THE FIELD OF THE CLOTH OF GOLD.

Lent by **Sir George Findlay.**

683. SUMMER HOLIDAYS.

Lent by **W. L. Wyllie, Esq., A.R.A.**

Squire, Miss Alice, R.I., 28 *Tavistock Road, Westbourne Park, London.*

684. SPRINGTIME.

685. AN AUTUMN AFTERNOON.

686. A QUIET STREAM.

Steer, H. R., R.I., *Earl Shilton, Hinckley, Leicestershire.*

687. OLIVER GOLDSMITH'S SOCIAL GATHERINGS, GREEN ARBOUR COURT, 1759.

Lent by **F. Newcombe, Esq.**

688. "LONG WAS THE GOOD MAN'S SERMON."

Longfellow.

Lent by **Mrs. Crompton.**

Stevens, A., *Osborne Lodge, Grove Park, Chiswick.*

689. DURHAM.

Stillman, Mrs., 46 *Fontanella di Borghese, Rome.*

690. FRA CURRADO D'OFFIDI.

Stock, Henry J., R.I., *Fulham Studios, 454a Fulham Road, London.*

691. IMMORTALITY'S SUNRISE.

Lent by **D. Dyce Brown, Esq., M.D.**

692. A YOUTH IN THE FLAMES OF FIRST LOVE.

Lent by **D. Dyce Brown, Esq., M.D.**

Thomas, William L., 190 *Strand, London.*

693. ONCE UPON A TIME.

694. FRAME OF DRAWINGS OF HIGHLAND SCENERY.

Thornycroft, Miss Helen, 11 *Avonmore Mansions, Avonmore Road, Kensington, London.*

695. ORCHIDS.

696. SHIRLEY POPPIES.

697. AZALEA, with Bronze Figure of "THE MOWER."

698. ORCHIDS.

Topham, Frank W. W., *Garden Chambers, 32 Great Ormond Street, London.*

699. RECRUITING FOR SAVONAROLA: "YE CANNOT SERVE GOD AND MAMMON."

Waite, R. Thorne, R.W.S., 7 *Maitland Park Villas, London.*

700. THE BLUE WAGGON.

Lent by James Orrock, Esq. R.I.

701. BETWEEN THE SHOWERS.

Walker, W. Eyre, A.R.W.S., 20 *Fitzroy Street, London.*

702. "THE BRIEF SILENCE OF AN HOUR
REIGNS O'ER THE FIELDS."

703. MOONRISE ON THE LOWTHER.

Walton, E. A., A.R.S.A., 203 *Bath Street, Glasgow.*

704. PHILLIS.

Walton, Frank, R.I., *Holmbury St. Mary, Dorking, Surrey.*

705. TORRISDALE, KINTYRE.

706. ARRAN, FROM CARRADALE.

Waterlow, Ernest, A., A.R.A., A.R.W.S., 1 *Maresfield Gardens, Fitzjohn's Avenue, London.*

707. THE EVENING HOUR.

Weatherhead, William, H.R.I., 12 Torbay Street, Kentish Town, London.

708. CHELSEA PENSIONERS.

Lent by J. Carbery Evans, Esq.

Weedon, A. W., R.I., 193 Portsdown Road, London, W.

709. NEAR SANDWICH, KENT.

710. EVENING SHADOWS, RICHBOROUGH, KENT.

Wetherbee, G., 37 Steele's Road, Haverstock Hill, London.

711. A FISHER MAIDEN.

Lent by H. W. Hill, Esq.

Whaite, H. Clarence, R.W.S., 16 Douro Place, Victoria Road Kensington, London.

712. CAMBRIAN SHEPHERDS.

Whitley, Miss Kate Mary, R.I., Fern House, South Wigston near Leicester.

713. AMMONITE AND MINERALS.

Wollen, W. B., 20 Blandford Road, Bedford Park, London, W.

714. "IT MAY BE FOR YEARS, IT MAY BE FOR EVER."

715. CAPTURE OF FRENCH GUNS BY THE UNION BRIGADE, AT WATERLOO.

Yeames, William, F., R.A., 4 Grove End Road, London.

716. THE LAW'S DELAY, BARNARD'S COURT.

Youngman, Miss A. M., R.I., 24, King William Street, Greenwich.

717. PELARGONIUMS.

718. RHODODENDRONS.

GROUP CXLIII.

ENGRAVINGS AND ETCHINGS; PRINTS.

Allbon, Charles F., 9 *Rosebery Road, Clapham Park, London.*

719. ON THE SANDS, SCHEVENINGEN.

720. ANTWERP.

721. LAGO DI COMO.

722. VENICE.

Appleton, T. G., *The Elms, Shalford, Surrey.*

723. REMBRANDT, EN OFFICIER.

724. NATURE.

725. THE SISTERS.

726. WASHINGTON.

Ball, Wilfrid, 4 *Albemarle Street, London.*

727. VENICE.

728. EVENING LIGHT.

Baskett, Charles E., *Charlton Villa, Gray Road, Colchester.*

729. A MEND BY THE WAY.

730. AN OLD STACKYARD, WINTER.

731. STRATFORD, ST. MARY BRIDGE.

732. DONYLAND WOOD, WINTER.

Bigland, Percy, 32 *Tite Street, Chelsea, London.*

733. THE RT. HON. W. E. GLADSTONE (mezzotint).

Burgess, Walter W., *7 Paulton's Terrace, Chelsea, London.*

- 734. BITS OF OLD CHELSEA.
- 735. BITS OF OLD CHELSEA.
- 736. BITS OF OLD CHELSEA.
- 737. FROM WATERLOO BRIDGE.
- 738. CANTERBURY CATHEDRAL.
- 739. NORWICH.

Cameron, D. Y., *134 Bath Street, Glasgow.*

- 740. FRAME OF ETCHINGS.
- 741. FRAME OF ETCHINGS.

Charlton, Edward W., A.R.P.E., *Springfield, Ringwood, Hants*

- 742. MANNING THE PILCHARD BOATS, CORNWALL.
- 743. COASTERS IN HARBOUR.
- 744. TRAMPS.
- 745. SOUTHAMPTON.
- 746. REPAIRING THE COAST ROAD.
- 747. THE OLD HARBOUR.

Chattock, R. S., F.R.P.E., *15 Lancaster Road, Belsize Park
London.*

- 748 THE HOLT.
- 749. POPLARS.
- 750. THE MOORHEN.
- 751. ON HAMPSTEAD HEATH.
- 752. BLAST FURNACES.

Clouston, Robert S., *Wymeswold, Watford, Herts.*

- 753. THE JEW MERCHANT (after Rembrandt).
- 754. THE VISCOUNTESS CROSBIE (after Sir Joshua Reynolds).

Dale, Mrs. G., 128 *Brecknock Road, London.*

755. SWEET VIOLETS (after F. Dicksee).

Dalgleish, T. Irving, 20 *Ash Grove, Cricklewood, London.*

756. AN EASTERN PROCESSION, NORTHERN SPAIN.

757. CALLE MAYOR, FUENTENABIA.

758. ANITA.

759. SUNSET.

Dicksee, Herbert, 87 *Canfield Gardens, London.*

760. MEMORIES.

761. A TIGRESS.

762. HIS MAJESTY.

763. A WANDERER.

Ellis, Tristram, 8 *Trevor Terrace, Knightsbridge, London.*

764. { THE GOLDEN HORN (Artist's proof).
THE MIDNIGHT SUN, NORTH CAPE (Artist's proof).

765. ST. MICHAEL'S MOUNT, CORNWALL (Artist's proof).

766. { A CORNER OF THE PARTHENON, ATHENS (Artist's proof).
THE YEIN DJAMI, CONSTANTINOPLE (Artist's proof).

767. THE "VICTORY," PORTSMOUTH (Artist's proof).

Evershed, Arthur, A.R.P.E., 29 *Rosslyn Hill, Hampstead, London.*

768. NINE SUBJECTS, drawn directly on Copper, from Nature.

769. NINE OUTDOOR ETCHINGS, drawn directly on Copper, from Nature.

770. THE TOWER OF LONDON.

Finnie, John, 20 *Huskisson Street, Liverpool.*

771. MARGIN OF RYDAL.

772. BY PASTURES GREEN AND QUIET WATERS.

Gardner, W. Biscoombe, *Thirlestane, Hind Head, Haslemere, Surrey.*

773. WOOD ENGRAVINGS (Artist's proofs).

Gascoyne, George, 8 *Gloucester Mansions, Harrington Gardens.*

774. PLOUGHING.

775. A WAYFARER.

Haden, Francis Seymour, P.R.P.E., *Woodcote Manor, Alresford, Hants.*

776. MORNING, NEAR SWANAGE, DORSET.

777. EVENING, NEAR SWANAGE, DORSET.

778. DURLESTON HEAD, DORSET COAST.

779. UNDERCLIFF, DORSET COAST.

780. CORFE COMMON, DORSET.

781. A VILLAGE STREET IN CORFE, DORSET.

782. AN INN KITCHEN IN CORFE, DORSET.

783. STUDY OF OAKS, CHESTERFIELD, DERBYSHIRE.

Haig, Axel H., *Grayswood Hill, Haslemere, Surrey.*

784. ENGLISH PASTORAL.

785. THE PORTALS OF REIMS.

786. THE AISLES OF CHARTRES.

787. THE CHANCEL OF DURHAM CATHEDRAL.

Hall, Oliver, R.P.E., 74 *Tulse Hill, London.*

788. A STUDY OF TREES.

789. A WINDY DAY ON ANGERTON MOSS.

790. A WINDY DAY.

Heseltine, J. P., 196 *Queen's Gate, London.*

791. SIX ETCHINGS FROM NATURE.

Hole, William, R.S.A., *30 Saxe Coburg Place, Edinburgh.*

792. THE WOOD SAWYERS.

793. THE JUMPING HORSE (after John Constable).

794. HE IS COMING (after Matthew Mario).

795. DON GASPAR DE GUZMAN, COUNT OF OLIVEZEZ (after Velasquez).

796. MILL ON THE YARE (after J. Crome).

Huson, Thomas, R.I., R.P.E., *Northcote, Waterloo, Liverpool.*

797. HERALDS OF A STORM.

Law, David, *9 Regent's Park Terrace, London.*

798. WATER MEADOWS.

Lent by **The Fine Art Society.**

799. SILVER BIRCHES.

Lent by **The Fine Art Society,**

800. ARUNDEL CASTLE.

Lent by **Messrs. Dowdeswell.**

801. BIRTHPLACE OF BURNS.

Lent by **Robert Dunthorne, Esq.**

Lewis, C. W. Mansel, *Stradey Castle, Llanelly, Carmarthenshire*

802. COUNTING THE FLOCK.

803. A WELSH HAT.

804. A VAGRANT.

Lowenstam, Leopold, *4 Wells Road, North Gate, Regent's Park, London.*

805. IN A ROSE GARDEN.

806. A FAVOURITE AUTHOR.

807. HARVEST FESTIVAL.

Macbeth-Raeburn, H., 6 *St. Paul's Studios, West Kensington, London.*

808. PORTRAIT (after Vandyke).

809. THE 'CELLO PLAYER (after Metza).

810. WIND ON THE WOLD (after Mason).

Macbeth, Robert W., A.R.A., *Longsden, 1a Carlton Hill, London.*

811. THE GARDEN OF LOVE (after Titian).

812. THE SPINNERS (after Velasquez).

813. ALOZO CANO (after Velasquez).

814. BACCHUS AND ARIADNE (after Titian).

815. THE CAST SHOE, LYNN FERRY (original etching).

816. HARBOUR OF REFUGE (after Fred Walker).

Lent by **Messrs. Thomas Agnew & Sons.**

817. PLOUGH (after Fred Walker).

Lent by **Messrs. Thomas Agnew & Sons.**

818. SPRING (after Fred Walker).

Lent by **Messrs. Thomas Agnew & Sons.**

819. AUTUMN (after Fred Walker).

Lent by **Messrs. Thomas Agnew & Sons.**

820. FEN FARM (original etching).

Lent by **Messrs. Thomas Agnew & Sons.**

Martyn, Miss Ethel King, 27 *Ainger Road, Primrose Hill, London.*

821. ILLUSTRATIONS TO MILTON'S "LYCIDAS."

May, W. Holmes, *Nutfield, Balham, London.*

822. THE GARDEN FRONT, HADDON HALL.

823. SUNRISE ON THE WELSH COAST.

Menpes, Mortimer, R.P.E., *Osborn Lodge, Fulham, London.*

824. BANQUET OF THE OFFICERS OF THE ARCHERS OF ST.
ADRIAN (after F. Hals.)

825. A CAPTIVE PERSIAN (Original drypoint).

826. DOROTHY (Original drypoint).

827. DRYPOINT.

Murray, Charles O., 41 *The Grove, Hammersmith, London.*

828. HAYMAKERS.

829. THE PATRIARCH.

830. THE GREAT FROST OF 1891, ON THE THAMES.

831. THE VIRGIN PORCH, OXFORD.

Paton, Hugh, 8 *Fetter Lane, Manchester.*

832. A REEF IN THE FORESAIL.

833. A CHESHIRE LANE.

834. HIGHLAND PASTURAGE.

Phillips, Laurence B., R.P.E., *Chesham House, 134 Sutherland Avenue, London.*

835. A BRITTANY CASTLE.

836. THE PIAZZETTA, VENICE, AFTER RAIN.

Piper, Miss Elizabeth, 3 *Oakley lats, Oakley Street, Chelsea, London.*

837. THE CHELSEA HOMES OF CARLYLE, ROSSETTI, TURNER,
AND GEORGE ELIOT.

838. LE MUSÉE DE CLUNY, PARIS.

839. OLD CHELSEA CHURCH.

840. THE SPINNING WHEEL (an interior with a woman
spinning).

841. THE CLOISTERS, BRISTOL CATHEDRAL.

Pratt, Joseph B., *Northover, Dartmouth Park Avenue, London.*

842. DANIEL'S ANSWER TO THE KING (after Briton Riviere, R.A.)

843. TRIM (after Sir E. Landseer).

844. STOLEN KISSES (after Briton Riviere, R.A.).

845. AFTER A STORM IN THE HIGHLANDS (after Rosa Bonheur).

Robertson, Arthur, *146 Portsdown Row, Maida Vale, London.*

846. "I WON'T SIT" (after J. G. Cotman).

847. THE VILLA D'ESTE, TIVOLI.

Robertson, Henry Robert, *1 Steele's Studios, Haverstock Hill, London.*

848. ULYSSES DERIDING POLYPHEMUS.

849. AN UPLAND FARM.

850. "THE PLOUGHMAN HOMEWARD PLODS HIS WEARY WAY."

Robertson, Percy, *Godalming, Surrey.*

851. WINCHESTER.

852. A WET DAY, WITLEY.

853. BUT ONE.

Robinson, Gerald, *Newton House, Leatherhead, Surrey.*

854. QUEEN HENRIETTA MARIA.

855. THE BURGOMASTER.

856. EARL SPENCER, K.G.

857. THE PARSON'S DAUGHTER.

Sherborn, Charles Wm., *540 King's Road, Chelsea, London.*

858. SEYMOUR HADEN, ESQ.

859. OLIVER CROMWELL.

860. SHAKESPEARE.

861. ARCHBISHOP OF CANTERBURY.

862. FRAME OF BOOK PLATES.

863. FRAME OF BOOK PLATES.

Short, Frank, *8. Wentworth Studios, Manresa Road, Chelsea, London.*

864. DIANA AND ENDYMION (after G. F. Watts, R.A.).

865. PER HORSE POWER PER HOUR (original mezzotint).

866. SWISS PASS (after J. M. W. Turner, R.A.).

867. A SUSSEX DOWN (after John Constable, R.A.).

868. LOW TIDE AND THE EVENING STAR (original etching).

869. RYE PIER (original aquatint).

Slocombe, Fred, *Fair View, Holder's Hill, Hendon, London.*

870. A YORKSHIRE LANE.

871. GOING HOME.

872. A HUNTING MORN.

873. WHARFEDALE.

874. THE AVON AT SALISBURY.

Slocombe, Edward, *Oxley Warren, Watford, Herts.*

875. THE MATTERHORN.

876. THE GRAND PLACE, ANTWERP.

Spread, William, R.P.E., *27 Pembridge Crescent, Bayswater, London.*

877. A STREET IN BRUGES.

878. EN NORMANDIE.

879. AN OLD SHOP, VITRÉ, FRANCE.

880. FAUBERTS PLACE, REGENT STREET, LONDON.

Stacpoole, F., *4 Theresa Terrace, West End, Hammersmith.*

881. "THEY SAY THE LION AND THE LIZARD KEEP
THE COURTS WHERE JAMSHYD GLORIED AND DRANK
DEEP."—*After Briton Riviere, R.A.*

882. THE NIGHT WATCH (after Briton Riviere, R.A.).

Sternberg, Frank, *Hillside Cottage, Bushey, Herts.*

883. A BACCHANTE (after G. F. Watts, R.A.).

884. DR. BUTLER (after Professor Herkomer, R.A.).

885. CANON ELLISON (after Professor Herkomer, R.A.).

886. PAULINE (after G. P. Jacomb-Hood).

887. NAPOLEON (after Greuze).

888. IN FAIRYLAND (after C. E. Hallé).

Strang, William, F.R.P.E., *17 St. George's Square, Regent's Park, London.*

889. THE EARTH FIEND.

890. A PORTRAIT.

891. A PORTRAIT.

892. A PORTRAIT.

893. A PORTRAIT.

Thomas, Percy, *45 Grafton Street, Fitzroy Square.*

894. THE OLD TABARD INN, SOUTHWARK.

895. THE WHITE HART INN, SOUTHWARK.

Urwick, W. H., R.P.E., *Stowey House, Clapham Common, London.*

896. SONNING-ON-THAMES.

897. THE WOODS IN WINTER.

898. CULLODEN FIELD.

899. YORKSHIRE COTTAGES.

900. CLOVELLY.

Watson, Charles J., 5 *Wentworth Studios, Manresa Road, Chelsea, London.*

901. CHEYNE WALK, CHELSEA, 1889.

902. CAMPDEN, GLOUCESTERSHIRE.

903. ST. JACQUES, LISIEUX.

904. ST. ETIENNE DU MONT, PARIS.

905. RUE CHANOMESSE, PARIS.

906. RUE ST. MARTIN, BAYEUX. .

Wehrschmidt, Daniel A., *Cleveland, Bushey, Herts.*

907. THE LOVE LETTER (after Luke Fildes, R.A.).

908. MARQUIS OF DUFFERIN AND AVA (after Frank Holl, R.A.).

909. GENERAL SIR HERBERT STEWART (after Frank Holl, R.A.).

910. EARL OF YARBOROUGH (after Frank Holl, R.A.).

911. FAREWELL (after P. H. Calderon, R.A.).

912. SIR EDWARD WATKIN, M.P. (after H. Herkomer, R.A.).

GROUP CXLIV.

CHALK, CHARCOAL, PASTEL AND OTHER DRAWINGS.

Charlton, John, 22 *West Cromwell Road, London.*

913. AN IMPENDING CATASTROPHE.

914. A CARRIAGE ACCIDENT.

915. HALT!—CHARGE OF LANCERS AT MILITARY TOURNAMENT.

916. WARE WIRE!

917. LUDGATE HILL: A SLIPPERY PAVEMENT.

918. A VETERINARY EXAMINATION.

919. "TWIXT THE DEVIL AND THE DEEP SEA."

920. MUSICAL RIDE OF THE 17TH LANCERS.

921. HORSE SHOW: HARNESS HORSES TROTting.

922. EQUESTRIANS AT A MEET OF THE COACHING CLUB,
HYDE PARK.

923. WAITING FOR THE QUEEN, ROTTEN ROW.

924. LADIES TILTING.

925. MEET OF THE DEVON AND SOMERSET STAGHOUNDS.

926. COVER FOR CHRISTMAS NUMBER (SLEDGING).
Lent by The Proprietors of "The Graphic."

Crane, Walter, 13 *Holland Street, Kensington, London.*

927. THE TRIUMPH OF LABOUR.
(Artist's proof of a woodcut.)

928. SET OF ORIGINAL DRAWINGS FOR HAWTHORNE'S WONDER
BOOK.

929. THE LEGEND OF THE GOOSE AND GOLDEN EGGS.
1. Fortune. 2. Misfortune.

Du Maurier, George, *New Grove House, Hampstead, London.*

930. SIX PEN AND INK SKETCHES—ORIGINALS OF CUTS
IN "PUNCH."

Gardner, W. Biscombe, *Thirlestane, Hind Head, near Haslemere,
Surrey.*

931. PALACE OF FONTAINEBLEAU.

Granby, The Marchioness of, 23A *Bruton Street, Bond Street,
London.*

932. THE LADY SUSAN KEPPEL.

933. THE SPEAKER OF THE HOUSE OF COMMONS.

Hare, St. George, *Bolton Studios, Redcliffe Road, London.*

934. CAPTIVES.

Keene, Charles (the late).

- 935. POLO FOR THE PEOPLE.
- 936. ROUND THE STUDIOS.
- 937. IMPRACTICABLE.
- 938. THE HAUNTED ROOM.
- 939. WAGES.
- 940. A HUNGRY CLAIMANT.
- 941. THE PICTURES.
- 942. REPRISALS.
- 943. OVERPRESSURE.
- 944. THE LAST RESOURCE.
- 945. LITTLE WIFE.
- 946. ART.
- 947. DIRECTIONS.
- 948. BON CHIENIE.
- 949. IRRESISTIBLE.
- 950. OPPRESSION.
- 951. RAILWAY RISKS.
- 952. OUR VILLAGE INDUSTRIAL COMPETITION.
- 953. DECEIVERS EVER.
- 954. EXTREMES MEET.

Lent by **Harry Keene, Esq.**

Linton, Sir James D., P.R.I., *5 Cromwell Place, London.*

- 955. TWELVE ILLUSTRATIONS TO SHAKESPEARE'S "HENRY VIII."

Lent by **Messrs. Cassell & Co.**

Overend, W. H., *17 Southampton Street, Fitzroy Square, London.*

956. SIR RICHARD GREVILLE IN THE "REVENGE."

"Sink me the ship, Master Gunner.
Sink her, split her in twain.
Let us now fall into the hands of God,
Not into the hands of Spain."

ILLUSTRATIONS TO "IN A CONNING TOWER"—

957. THE SHANNON DISABLED RETURNING HOME.

958. SHELL BURSTING IN "MAJESTIC'S" BATTERY.

959. THE MIDSHIPMAN WATCHING THE TORPEDO.

960. THE WOUNDED CAPTAIN IN THE CONNING TOWER.

961. THE "MAJESTIC" RAMMING THE ENEMY'S SHIP.

Stacey, Walter S., *Hillcote, Cannon Place, Hampstead, London.*

962. IN GREEK WATERS.

Lent by Messrs. Blackie & Son.

963. DRAWINGS FOR THE "STRAND MAGAZINE."

Lent by Geo. Newnes, Esq., M.P.

Stott, William, of Oldham, *66 Adelaide Road, London.*

964. PORTRAIT OF A CHILD.

965. THE EIGER.

966. THE JUNGFAU.

Swan, John M., *3 Acacia Road, St. John's Wood, London.*

967. 1. TIGRESS DRINKING.

968. 2. PUMA (FEMALE).

969. 3. LIONESS WALKING.

970. 4. INDIAN LEOPARDS.

971. 5. POLAR BEAR.

972. 6. LIONESS WALKING.

Tenniel, John, 10 Portsdown Road, Maida Hill, London.

973. A WAITING GAME.

974. THE NEW QUEEN OF THE MAY.

975. INNINGS CLOSED.

976. WHEN GREEK MEETS GREEK.

977. THE POLITICAL "JOHNNY GILPIN."—THE START.

978. THE POLITICAL "JOHNNY GILPIN."—THE FINISH.

979. "WILLIAM THE WHEELMAN."

980. "WILL THEY WORK?"

981. BACK!

982. THE WHITE ELEPHANT.

Weguelin, J. R., 3 Stratford Avenue, Kensington, London.

983. ILLUSTRATIONS TO ANACREON.

Lent by Messrs. Laurence & Bullen.

984. ILLUSTRATIONS TO CATULLUS.

Lent by Messrs. Laurence & Bullen.

ARCHITECTURE.

Constructive Architecture is classified under Group CLII., but these Exhibits form part of the British Fine Art Collection.

Adams, Maurice B., F.R.I.B.A., 332 Strand, London.

985. GLEN RIDGE, NEW JERSEY, U. S. A.

986. BUNGALOW, NINE-MILE RIDE, BERKS, ENGLAND.

987. MAUSOLEUM, near Sydney, Australia, in memory of the
Hon. JOHN FRAZER.

Aitchison, Professor George, A.R.A., 150 Harley Street, London.

988. ROYAL EXCHANGE ASSURANCE, 29 PALL MALL, S.W.

989. THE ARAB HALL.

Lent by Sir F. Leighton, Bart., P.R.A.

990. DRAWING ROOM.

Lent by Sir Wilfrid Lawson, Bart., M.P.

991. SMALL DRAWING ROOM.

Lent by Sir Wilfrid Lawson, Bart., M.P.

992. CEILING.

Lent by Sir Sydney Waterlow, Bart., M.P.

993. DRAWING ROOM.

Lent by Eustace Smith, Esq., M.P.

994. THE HALL.

Lent by The Right Hon. Lord Leconfield.

995. NEW DRAWING ROOM, LONDON.

Anderson, R. Rowand, LL.D., 16 Rutland Square, Edinburgh.

996. NEW MEDICAL SCHOOL, EDINBURGH UNIVERSITY.

997. CATHOLIC APOSTOLIC CHURCH, EDINBURGH.

998. DUMBLANE CATHEDRAL.

999. GOVAN PARISH CHURCH.

1000. CENTRAL STATION HOTEL, GLASGOW.

1001. SCOTTISH NATIONAL PORTRAIT GALLERY, EDINBURGH.

1002. ST. PAUL'S CHURCH, GREENOCK.

Ashlin, George C., R.H.A., 12 Trinity Street, Dublin.

1003. EXTERIOR VIEW OF ST. COLMAN'S CATHEDRAL, QUEENSTOWN.

1004. INTERIOR VIEW OF ST. COLMAN'S CATHEDRAL.

1005. EXTERIOR VIEW OF THE O'CONNELL MEMORIAL CHURCH, CAHERCIVEEN, CO. KERRY.

1006. INTERIOR VIEW OF THE O'CONNELL MEMORIAL CHURCH

Aston-Webb and E. Ingress Bell, Messrs., 19 Queen Anne's Gate, Westminster, London.

1007. VICTORIA COURTS, BIRMINGHAM.

1008. METROPOLITAN LIFE ASSURANCE SOCIETY'S OFFICES.

1009. COMPLETION OF SOUTH KENSINGTON MUSEUM.

1010. PEVEREY, SHROPSHIRE.

Belcher, John, 20 Hanover Square, London.

1011. DESIGN FOR SOUTH KENSINGTON MUSEUM, EXTERIOR VIEW.

1012. DESIGN FOR SOUTH KENSINGTON MUSEUM, INTERIOR VIEW.

Binyon, Brightwen, Princes Street Chambers, Ipswich.

1013. SUNDERLAND TOWN HALL, VIEW OF THE EXTERIOR.

Blomfield, Reginald, M.A., 39 Woburn Square, Bloomsbury, London.

1014. DRAWING OF 20 JAMES STREET, S.W.

1015. HOUSE AND GROUNDS AT BROCKENHURST, HANTS.

1016. PROPOSED ENGLISH CHURCH AT BERNE.

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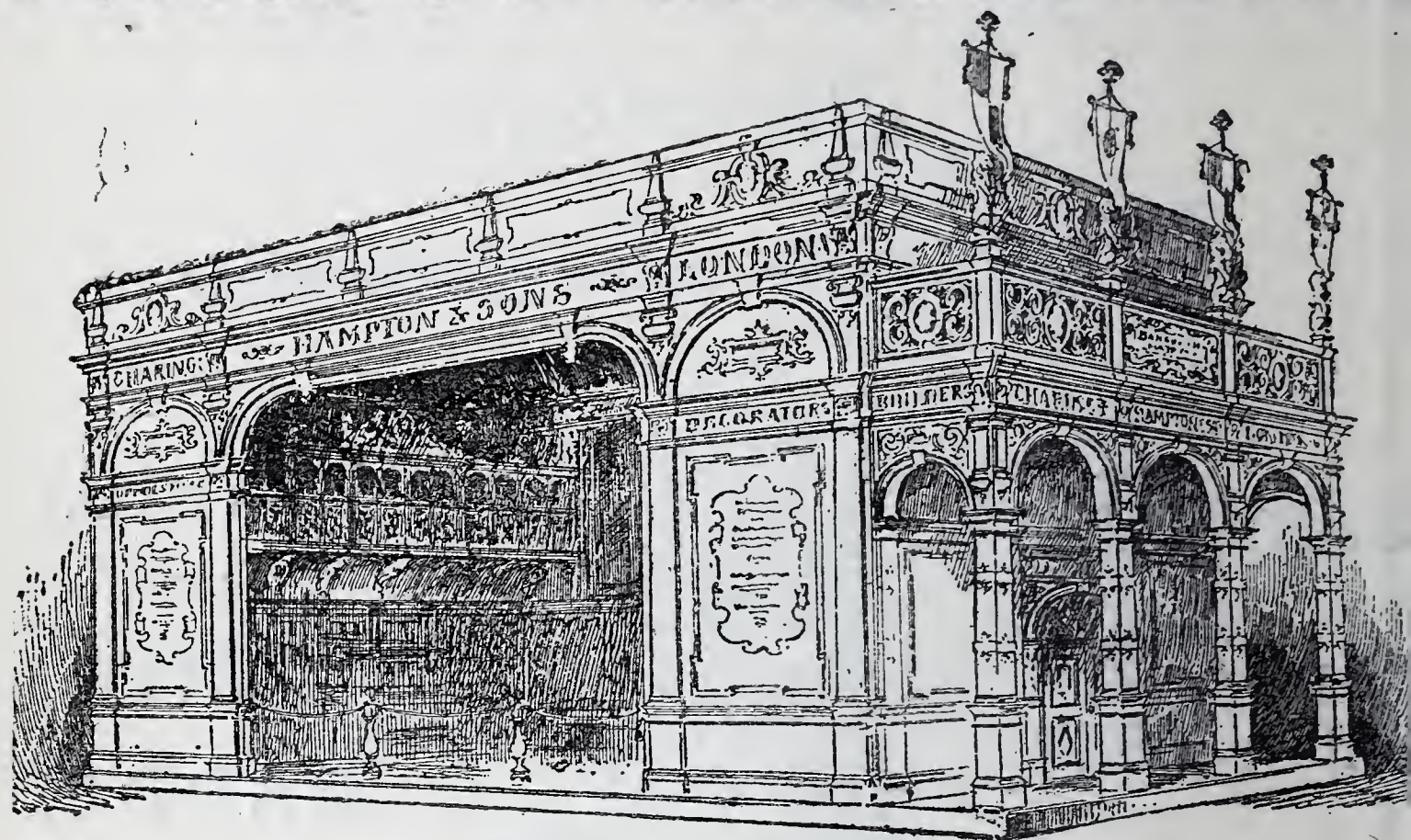
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LIBERAL ARTS—EDUCATION, LITERATURE, ENGINEERING, PUBLIC WORKS, MUSIC, AND THE DRAMA.

EDUCATION.

By J. G. FITCH.

H.M. Chief Inspector of Schools.

England differs from most European countries and from America in having been very late to accept on the part of the State any responsibility for providing the means of public education. It cannot be said even yet to possess a coherent and symmetrical system, such, for example, as that which the forethought of Swiss and German statesmen, of John Knox in Scotland, or of the founders of the New England States created for maintaining a sufficient supply of schools. Its present educational position has been attained in slow degrees, and by means of numerous experiments and compromises. Until the middle of the present century, the only institutions which existed for public education were endowed or foundation schools, and schools established voluntarily by societies or private benefactors. The earlier endowed schools date from the fifteenth and sixteenth, and a small number from the fourteenth century, and had for their main purposes the teaching of Latin and Greek—then the chief, if not the only, accessible instruments of intellectual culture—and the preparation of scholars for the ancient universities. Another large group of endowed schools, dating chiefly from the beginning of the eighteenth century, had for their chief object the education of the poor in the elements of knowledge, and the “principles of the Established Church.” Under the name of parochial or Charity schools, endowed foundations of this type continued until recent times to furnish gratuitous instruction of a valuable kind, and often to provide clothing and apprenticeship. In the beginning of the present century, Dr. Andrew Bell and Joseph Lancaster aroused by their personal efforts considerable enthusiasm

on behalf of popular education, and became the founders of two great societies, the National Society for the Education of the Poor in connection with the Established Church, and the British and Foreign School Society, which was composed of persons of various Christian denominations, but which sought to make the school instruction Scriptural but not sectarian. Both societies achieved large success in inducing local committees in all parts of the country to establish and maintain elementary schools. In 1839, when, at the instance of Lord Lansdowne, Lord Brougham, and Lord John Russell, the first grants were made by Parliament in aid of public education, it was through the agency of these two societies that those grants were made. A Committee of Privy Council was then formed to administer such funds as might from time to time be entrusted to it by Parliament, and in 1846 appeared the first Minutes of Council, framed largely by Sir James Kay Shuttleworth, the secretary to the Department. These Minutes established a system of public inspection, provided for the training and certification of teachers, and defined the conditions under which public aid should be dispensed to the schools. Until the year 1870, however, the State made no provision for the establishment of new schools, but simply confined its own action to the administration of grants in aid of such schools as were founded or managed by the two societies and other voluntary or religious bodies. In that year the Elementary Education Act recognised for the first time the duty of the State to provide for every child the means of instruction. It proceeded on the assumption that the voluntary system existed, and ought to be maintained and encouraged, but that it needed to be supplemented by other provision wherever it proved to be deficient. It enacted, therefore, that in those places School Boards should be elected by the ratepayers, and should be charged with the duty of erecting and maintaining such schools as were needed to make the supply of instruction—computed as accommodation for one in six of the whole population—complete. The Act of 1870 further enjoined that in all aided schools, denominational and undenominational alike, parents who objected to any form of religious teaching or worship might withdraw their children from such teaching without losing any of the other benefits of the school. It was also enacted that in all schools provided by local Boards, and aided by rates, no catechism

or religious formulary distinctive of any particular denomination should be in use. The Education Department was empowered to administer public aid impartially to all public day-schools which fulfilled the required conditions as to the qualifications and number of the staff, the suitableness of the buildings, and the quality of the secular instruction, but was not charged with the duty of inquiring into or regulating the religious instruction, which was in all cases to be given in such part of the day as to leave for every meeting of the school two hours of unbroken secular teaching. Other provisions of the Education Act empowered School Boards to frame local bye-laws compelling the attendance of children at school, and subsequent Acts have created School Attendance Committees, to exercise this power wherever Boards do not exist. There is now in every part of the country a local authority which, by means of its officers, enforces the attendance of children between the ages of five and fourteen, except those partially or wholly exempted for labour by passing the standard examination appropriate to their age.

These measures have proved very effective for their purpose. In 1870, the year of the passing of [the Education Act, there were in England and Wales 9,563 voluntary schools receiving Government aid and inspection, with a total of 1,152,389 scholars, and 12,467 certificated teachers. The Parliamentary grant amounted to £464,943. The Report of the Education Department for the year 1891-2 shows that there are now 4,846,891 scholars on the registers, and 3,749,956 in average attendance in day schools, and 51,974 in evening schools; the total number of certificated teachers has risen to 47,823, that of assistants to 23,508, of pupil-teachers to 28,131, and of students in training colleges to 3,310.

Of the large additional school accommodation thus provided during the last 20 years, the School Boards, in the exercise of their statutory powers, have furnished places for about 2,000,000 scholars, and the zeal of the friends of voluntary schools about 1,750,000. There is now ample accommodation in public elementary schools for five-and-a-half millions of children, or for considerably more than one-sixth of the entire population.

The funds by which these schools are maintained in efficiency were until very recently derived from three sources: (1) The Parliamentary Grant, amounting to £3,434,759; (2) Local contributions,

either in the form of rates to Board Schools or subscriptions to voluntary schools; and (3) The fees paid by parents, amounting to about £2,000,000. But in 1891 the Assisted Education Act transferred this last charge, or nearly the whole of it, from the parents to the Imperial revenue, and gave to all children the right to gratuitous education. It may now be roughly estimated that of the total annual cost of elementary education in England and Wales (£7,813,706), nearly five-and-a-half millions will be paid out of public funds by the Central Department; one million and a half by local rates; and nearly £800,000, or about one-tenth of the whole, by voluntary contributions. The figures for Scotland, which has a separate Education Department of its own, show a similar general result. There are in the primary schools of that country, 680,580 children, or more than 1 in 6 of the entire population, of whom an average of 540,028 are in daily attendance.

The administration of the English Education Department is entrusted mainly to the Vice-President of the Privy Council. Of those who have held this office since its establishment in 1856, the most conspicuous and influential have been Mr. Robert Lowe, afterwards Lord Sherbrooke, who introduced the system of assessing the amount of the grant by the efficiency of the school as tested by examination; Mr. W. E. Forster, the author of the Education Act of 1870; Mr. A. J. Mundella, who in 1881 greatly enlarged and improved the educational provisions of the Code, and, in particular, did much to encourage the adoption of the methods of Fröbel and Pestalozzi in the infant schools; and Sir W. Hart-Dyke, under whose administration was passed the Assisted Education Act.

It is also to the last-mentioned of these statesmen that is to be credited an important new experiment in respect of the training of teachers. The Government has long assisted by large annual grants the Normal Colleges—44 in number—in which schoolmasters and mistresses are trained for their special work. But these institutions do not supply the whole annual demand for trained teachers, and accordingly the Universities of the United Kingdom and the numerous provincial Colleges of University rank, which have of late been founded in the principal towns, have been invited to co-operate with the Department, by attaching to them Normal Classes for the special professional training of such of their students as desire

to become elementary teachers. In this way the supply of persons who have received a liberal education, and who have also been specially trained in the art of teaching, will be greatly increased.

It will thus be seen that the whole of the provision for elementary education is now aided and controlled by the State. But hitherto no public aid or supervision has been extended in England to Secondary Education. The provision of secondary and intermediate schools consists mainly—(1) of endowed foundations usually called grammar schools; (2) of proprietary schools established by societies, companies, or other local bodies; and (3) of private schools. Of these, the schools of the first class only can be regarded as in any sense within the purview of the Government; for the Charity Commission, which is a permanent Department of the State, is entrusted with the power of framing schemes for the government of all endowed schools, and of determining their educational character.

Many recent facts in our history, however, indicate that the sphere of public influence over secondary instruction is widening, and is likely to be further enlarged. In Wales an Intermediate Education Act (1889) is already operating beneficially, in co-ordinating the work of the Secondary Schools. In Scotland, the influence of the Education Department has extended to institutions considerably above the rank of elementary schools. The Local Taxation Act of 1890 for England and Wales set free a large annual sum derived from liquor licences and placed it at the disposal of the County Councils for the promotion of technical and secondary instruction. At present a large portion of this sum is being expended in encouraging such forms of science teaching and of handicraft as have a more direct bearing on the local industries; but much of it will doubtless become available for other forms of advanced education. Treasury grants have recently been made to provincial Colleges in the largest industrial centres. A Select Committee of the House of Commons has recommended the enactment of a measure for the registration and better qualification of secondary teachers; and a Bill empowering Municipal bodies to establish, with the aid of local rates, secondary schools wherever they may be needed, was framed and introduced into the late Parliament by Mr. Arthur Acland, the new Vice-President of the Council.

Among the questions still under consideration, and on which Parliament and the public will probably, ere long, express a decisive opinion, are: (1) The enlargement of the powers of the Education Department under a responsible Minister of Public Instruction, so as to bring into harmony the various agencies for primary, secondary, and University instruction, at the same time leaving large scope for local effort and initiative, for varied types of schools and for the liberty of teaching. (2) The provision of such links between all institutions for public instruction as may enable scholars of promise to proceed from the elementary to the secondary school and thence to the University. (3) Better provision for the professional training of secondary teachers, analogous to that which has proved so valuable in the department of elementary instruction. (4) Such publicity respecting the aims and successes of secondary and higher schools as may enable parents to know their condition, and to choose what will suit them best. (5) The right place of manual and industrial training, and of practical and experimental science in the scheme of general education; and the relations in which such training ought to stand to the traditional discipline in languages and to intellectual culture generally. (6) The best means of enlisting the co-operation of local and academic bodies with the Government in the maintenance of a high ideal standard of education, and in its improvement from year to year.

THE PRESENT STATE OF ENGLISH MUSIC.

BY J. A. FULLER MAITLAND.

In a retrospect of art, England would stand high among the nations that have done great work in music. From the 13th century when the Reading rota, "Sumer is icumen in," showed what could be done in secular music, down to the death of Purcell at the end of the 17th, Englishmen had always been among the pioneers of the art. Dunstable in the dawn of polyphonic music, Byrd and Morley in the most glorious period of the madrigal, Gibbons in its latest development, and Purcell in the early days of opera, all were men in advance of their time, whose works compare favourably

with those of their foreign contemporaries. When once opera was established as a fashionable entertainment, all was changed ; and, from the advent of Handel until quite recent times, the dominant influence of foreign composers and performers has tended to the destruction of much that was worthy and original in English music. As a thoughtful writer has lately said, "England abrogated her position as a workshop of Art, and became instead the bazaar at which it was retailed." *

During this period of subordination, men who in more fortunate circumstances might have made their name illustrious were virtually confined to the music of the church or to glees, in which they could still hold their own. What might not such men as Samuel and Sebastian Wesley, or T. A. Walmisley have accomplished had they not been tied to their organ-seats? In oratorio, it is true, the English traditions have been preserved ; and this is the one form of art which has hitherto flourished as a native product, in spite of the fact that its chief examples in the past have been written for us by foreigners. This is the field in which English singers have been most successful in the past, and continue to hold their own in the present. But it is doubtful whether this class of composition would have retained its influence over the nation at large without the encouragement it has always received from the great provincial festivals—that of the Three Choirs of Gloucester, Hereford, and Worcester, and the Leeds, Birmingham, and Norwich Festivals, each of which occurs every three years. The incomparable beauty of tone heard in the choral singing at Leeds and Birmingham is enough to prove what sort of material is to be found in England ; and if, in common with the rest of Europe, we must still look across the Atlantic for the supply of our soprano soloists, we can furnish an abundance of fine voices in other departments, while many of our instrumentalists are attaining high positions which they richly deserve.

In opera, the retrospect is extremely gloomy. Only two men have ever permanently drawn away the ear of the public from the fashionable Italian or French compositions, and these were two of the least earnest of English composers, Balfe and Wallace. For the rest, no great or unqualified success has been achieved ; and in

* W. H. Hadow, "Studies in Modern Music."

different periods, Hatton's only opera, and two out of Stanford's three operas have had to be produced abroad; while the beautiful theatre devoted, two years since, to the encouragement of English opera has lately been perforce turned to ignoble uses. That opera is still far less prosperous than any other branch of the art may seem strange to some who hear of the revived glories of Covent Garden: of the performances given, not only in Italian, but in French, German, or English, according to the origin of the works played: of the various series held in different seasons of the year, not only, as formerly, in the summer months: of crowded audiences and a brilliant subscription list, and of revivals of such works as the Wagnerian trilogy side by side with the masterpieces of modern French and Italian dramatic art. Opera can, however, only be said to have an influence on the art of its time when new compositions are produced, and the genius of native composers is allowed proper opportunities to declare itself. Hitherto the new works written for Covent Garden have been few in number and for the most part remarkably weak, for no composer of recognized position has as yet been asked to contribute to the repertory.

The state of things is undoubtedly at its worst in respect of dramatic music; but as yet it can hardly be said that our best composers obtain the amount of recognition for their choral and orchestral works which they deserve. This is certainly not due to any lack of power or genius in the writers themselves, nor need we fear for the future, when we can point to such qualities as Hubert Parry's grandeur of style and command of the highest emotional expression; Stanford's poetic feeling, and assured mastery of orchestral colouring and effect; Mackenzie's romantic fancy and dainty grace, and Sullivan's geniality and unerring instinct for beauty of form. For the present moment, indeed, the younger composers are having it all their own way; it is as though managers and conductors were trying to light upon a native Mascagni. For example, the only new opera of English origin, at all worthy of the name, produced in London in 1892, was the work of a mere student, and that was given, not at the house where fashionable audiences are still flocking to celebrate the revival of opera, but in the course of a less pretentious, though not less artistic, venture which soon came to grief. The fortunate circumstances which launched *Cavalleria Rusticana*

on its prosperous career do not often co-operate, at least for Englishmen; and the danger of spoiling a promising youth by bringing out his immature efforts, and lauding them to the skies, is by no means an unreal one.

There is no lack of opportunities for musical training in England now-a-days; the Royal College of Music, founded in 1882, has done much for the cultivation of the highest branches of the art, and the friendly relations now established between it and the older school, the Royal Academy of Music, are wholly satisfactory. The Guildhall School of Music, founded shortly before the Royal College, has done much to spread musical education among those by whom a thorough artistic training was formerly unattainable on account of expense. Throughout the country, too, musical education is becoming more and more thoroughly organized. If, with or without State aid, permanent orchestras and opera-houses could be founded in London, or still better in all the important towns of Great Britain, we might look forward to a brilliant future for native art. Without such encouragements and opportunities, it is difficult to see what is to become of the hosts of meritorious students annually poured forth from the centres of musical learning. In this connection the weighty words lately written by one of the greatest of English singers may be quoted:—

“The nation must provide a home for those she has educated; there must be a national theatre in each of the principal cities of Great Britain, where opera, oratorio, or concerts can be given. This may all read like a wild dream. It is nothing of the kind, and can be done if there is the will. . . . If these things can be achieved in other countries, surely in rich England they are possible.”*

PHOTOGRAPHY.

BY CAPT. W. DE W. ABNEY, C.B., D.C.L., F.R.S.

Assistant Director of the Science and Art Department.

Great Britain, as far as artistic work is concerned, will, it is hoped, be considered to hold its own in Photography; more particularly in landscape work, for which its climatic peculiarities are

* “Student and Singer: the Reminiscences of Charles Sant’ey.”

specially adapted. In the exhibits which are catalogued there are specimens of the work of nearly every photographer of eminence, both professional and amateur, and representatives will be found of what—to borrow names from painting—we may call the pre-Raphaelite and the modern French schools, the one aiming at rendering detail in every part of the picture, and the other at eliminating all of it which is not absolutely necessary for pictorial purposes. Visitors at the Exhibition will be able to judge for themselves which are the works which give them the most satisfaction, and which they will compare with the exhibits of other nationalities. The latter school of photography, it may be remarked, is, comparatively speaking, modern, though Mrs. Julia Cameron had adopted it for portraiture twenty-five years ago, and it is believed that Great Britain has had, at all events till quite recently, almost a monopoly of it in its present form. Whether it will live and thrive depends upon the taste of the public, whose capriciousness in such matters the history of art in general so well demonstrates.

As regards the application of Photography to scientific purposes, it is believed that Great Britain is very much on the same level as other countries. Its use in medicine, chemistry, astronomy, physics, mineralogy, gunnery, and other branches of pure and applied science, has been fully demonstrated at the various learned societies, where a very large proportion of contributions are illustrated, more or less, by photographs. Had the early training of men who are now in the prime of their scientific career included photography, it is believed that much more would have been entrusted to the photographic plate as a recorder than is even done at the present time. Being the birthplace of the modern dry-plate process, which has caused the enormous increase in the numbers of those who practise photography, it is a matter of satisfaction that Great Britain has a commercial pre-eminence in the industry of the preparation of gelatine plates. This is probably due to the fact that, not only are the manufactured goods themselves of general excellence, but that our temperate climate enables the manufacture to be carried on at all seasons of the year without the aid of the expensive plant and adjuncts which other climates with more extreme temperatures necessitate. Our manufacturers have thus been able to produce their plates at a cheap rate, and to build up a large export trade,

notwithstanding the heavy duties which, in many cases, are charged on the product. On the other hand, the imports are inconsiderable, and home-manufactured goods are almost exclusively employed. The demand for English plates on the Continent is now very considerable, and is increasing year by year.

Paper and celloidin coated with sensitive gelatine films have now been brought to a state of perfection, and although it is believed that the application of a gelatine emulsion to paper was first made in Great Britain, it required an impetus to be given to the manufacturers to make a paper process satisfactory. An enterprising company from the United States gave the necessary impetus by the introduction of almost endless coated paper and their form of roller slide with which to use it. To the amateur this was at once a great boon, but the introduction of a thin celloidin film, similarly coated, by the same firm, thus avoiding the grain of the paper, made the process still more valuable, left the paper negative process a process of the past, and left the use of coated paper for the production of enlarged positions. The introduction of thick celloidin films in lieu of glass plates is a still further advance, as a gross of the former weighs about the same as a dozen of the latter. They are becoming widely used by the explorer and the tourist owing to their great convenience. Isochromatic photography is not very much further advanced than it was some years back, but it has been employed usefully in a variety of ways by the artist and by the scientific man, where light which is ordinarily non-photographic has to be employed.

A printing process, which also had its birthplace in England, is the platinotype, and this of late years has become a general favourite, not only on account of its simplicity, but also because of its permanency and of the artistic quality of the image. A very large proportion of all prints by the best firms and by amateurs are now executed in this process. As an example of the gradual increase in platinotype productions it may be stated that its first exhibit was made in 1880, and that in 1890 more than one-third of the number of pictures on the walls of the Photographic Society's Exhibition in Pall Mall were executed in it, while in 1892 more than one-half were by it. When all the exhibits in carbon, photo-gravure, and other processes are deducted it will be seen that platinotype is rapidly ousting the old silver printing processes from the field. The

process is not so widely known on the Continent, as may be gauged by an examination of the windows of the photographic print-sellers in various Continental towns compared with those at home. The latest novelty in this process is the cold development of the print which takes it out of the category of a merely mechanical process, as it allows the photographer to emphasise any portion of his picture he may desire. Photo-mechanical processes (collotype) do not seem to have made such a deep impression on publishers as to their value as could be wished, and those who have had books illustrated by them have often obtained the prints from the Continent instead of from home. In the future this will probably not be the case, as the processes have improved and the cost of production lessened.

A large number of books, on the other hand, are now illustrated by photo-gravures executed in England. At one time these also were executed largely abroad, but of late years the productions by the home processes have been so exquisitely beautiful, and with but little recourse to the graver's tool or other hand work, that they have competed with the foreign productions. It is satisfactory to think that the countrymen of Fox Talbot, the earliest photo-engraver, have been able worthily and successfully to compete with their neighbours.

Other minor processes there is not space to deal with. Examples of nearly all will be found in the World's Fair, and it is hoped and believed that they will worthily compare with those of other nationalities.

As regards apparatus in general there is not much to say. The hand camera is now of such a variety of forms that it would be hard to mention any *one* without doing injustice to others. Lenses have been improved as regards definition, angle of field and aperture, by the introduction of Jena glass, and by it a new power has been put in the hands of photographic opticians, who have not been slow to use it. The latest form of lens is the telephotograph of Dallmeyer, on which it would be premature to pass any opinion as to its ultimate capabilities, though it has done well what has so far been attempted with it. It promises to be of use for many purposes.

INSTRUMENTS OF PRECISION

(other than Electrical and Magnetic).

BY SILVANUS P. THOMPSON, D.Sc., F.R.S.,

Principal and Professor of Physics at the City and Guilds Technical College, Finsbury.

Instruments for scientific measurement may be classified under the following heads :—

Instruments for facilitating Calculation, Arithmetical and Geometrical.

Mechanical Measuring Instruments.

Surveying Instruments (including Mining Instruments).

Optical Instruments.

Acoustical Instruments.

Meteorological Instruments.

Instruments for Measurements of Heat.

Instruments for Calculation.—In the past ten years there has been little fundamental change in the numerous instruments of this group. The arithmometer of Thomas, of Colmar, still holds its own for arithmetical operations. Slide-rules have been improved by various makers, notably by Tavernier-Gravet (Paris), whose half-metre slides, engraved on celluloid, possess an accuracy hitherto unattained in such simple instruments. Various modifications, such as Bouchier's calculating circle, with circular logarithmic scales, have come into use for technical purposes. Planimeters have found an increasing demand amongst engineers, and the polar planimeter of Amsler-Laffon has proved of inestimable value in shortening calculations in naval design, as well as in other constructive departments.

Mechanical Measuring Instruments.—Other forms of mechanical integrator have been introduced—as, for example, by Vernon Boys, Hele Shaw, F. J. Smith, and others, in apparatus for the measurement and registration of mechanical power, and by many others in the construction of electric supply meters. The steam-engine indicator of James Watt was an early example of an apparatus mechanically rendering the product of two variable factors; but it did not

integrate the products otherwise than by tracing upon the card an area which subsequently needed to be evaluated by some approximate process of quadrature. Integrating indicators which automatically add up the work performed in a number of successive strokes during a given time have now assumed a practical form.

Doubtless these instruments will in time entirely supersede for many purposes the non-integrating instruments of Richards, Crosbie, and other forms of Watt indicator. The most recent of non-integrating forms is the mirror indicator of Perry, which exhibits the diagram optically, instead of inscribing it upon a card. Speed-indicating apparatus is undergoing changes. Centrifugal instruments, such as Buss's tachymeter and Young's speed-indicator, have superseded the old mechanical counter for many purposes. Horn's electric tachymeter applies the drag of induced eddy-currents to measure speed. A mechanical counter recently introduced has the novel feature of being combined with a clock movement, which throws it into gear, and again throws it out precisely half a minute later, thus avoiding possible errors of personal handling. Dynamometers for measuring during transmission the torque (or turning moment) of a rotating shaft have been developed by Ayrton and Perry, Deprez, F. J. Smith, and others from the older pattern of Morin. By combining such dynamometers with a speed-counter and with an integrating device to totalise the products, true work-measuring instruments have been produced, though they can hardly be said as yet to have come into general use by engineers. An excellent form, designed by F. J. Smith (Oxford), is manufactured by the Cambridge Scientific Instrument Company.

Another class of mechanical measuring instruments of recent origin comprises seismometers, for measuring the direction and amount of earthquake disturbances, or for measuring the amount of disturbance of vehicles in motion. The modern seismometer not only measures, but records its measurements. The apparatus of Gray, of Ewing, and of Milne, now brought to a wonderful degree of perfection, were developed almost entirely in Japan.

Another new mechanical instrument is the gravity-measurer of Vernon Boys, by means of which the perturbation of gravity by the presence of neighbouring metallic masses is indicated and measured in a small and compact apparatus. The extraordinary sensitiveness

here attained is mainly due to the introduction of the quartz fibre suspension.

Chronographs for measuring and recording minute intervals of time have not changed much within the last fifteen years. The chief improvements have been in the design by Deprez and by F. J. Smith of more rapidly acting electro-magnetic tracers, thereby reducing errors of observation. In Smith's fine electric chronograph the moving surface travels with rectilinear instead of circular motion. The new chronographs of the Cambridge Scientific Instrument Company, intended chiefly for physiological observations, exhibit many excellent improvements in detail. The use of rapid photographic processes for recording minute intervals of time has tended to alter the whole method of chronometry for many purposes. Rapid photographic plates, illuminated by sparks produced from electric oscillations of almost incredible frequency, have served Vernon Boys as an instrumental appliance of extraordinary delicacy to watch the progress of flying bullets, the vibrations of falling drops, and the propagation of sound-waves in air.

Amongst the laboratory appliances on which the chemist and the physicist alike depend is the balance. It is here only possible to indicate three points in which the balance of precision has recently been improved. By the use of short beams the slow oscillations of long beams have been reduced. By the application of simple damping-devices the motions have been rendered dead-beat. Both these improvements economise the time required for taking a reading. By devices for altering the sensitiveness in a known proportion, the deflections of the pointer of the instrument have been made direct-reading, thus still further saving time in the placing of the various masses in the scale-pan.

Another laboratory instrument is the kathetometer, for measuring heights. The original form of Froment-Deleuil still persists: but the form designed by the Cambridge Instrument Company has many advantages in the providing of geometric slides to preserve true positions instead of attempting to construct travelling parts without any freedom of motion beyond the liberty to slide. The obviously right principle of putting the scale, not upon the observing instrument, but at a distance from it, and close to the thing that is to be measured, is gaining ground; for by this means instrumental

errors due to defects in the kathetometer itself are minimized. The short simple micro-kathetometer of Quincke is not as much used as it should be. Its very cheapness debars instrument-makers from pushing its sale.

Of hydrostatic instruments the hydrometer or areometer continues to be made in many forms; but the old empirical scales of Twadell, Baumé, and others have, unfortunately, not yet died out, as they all must eventually do, in favour of simple direct scales of density. For very precise determinations of the density of spirits, the hydrometer of Sykes (used by the British excise officers) has been considerably improved by Derham.

Surveying Instruments. — Improvements in detail rather than any new departures characterize recent surveying instruments. Transit patterns of theodolite are tending to supersede the older forms in Europe. Messrs. Troughton & Simms have introduced special traversing heads for centring the instruments upon their tripods. They have also simplified the adjustments for levels. Clinometer levels are coming into more frequent use, and station pointers have recently been improved. There has been much use made of the photographic camera in outpost surveying.

Optical Instruments. — Photometers have been much perfected in recent years. The grease-spot photometer of Bunsen has been modified by Von Hefner and by Krüss, who have devised special prisms to enable the observer to have a simultaneous view of the two illuminated surfaces of the disk. Joly (Dublin) has replaced the Bunsen disk by a block of translucent paraffin divided across by a leaf of opaque metal. The light received on the two faces illuminates the edges by internal diffusion. It therefore requires no mirrors or prism, but is simply moved to and fro along the bench of the photometer until the two edges show equality of illumination. In the photometer of Lummer and Brodhun the Bunsen disk is replaced by an optical device equivalent to a Bunsen screen having perfect transparency at the centre. This is attained by pressing together by their hypotenusal faces (which are surfaced so as to be in optical contact only over a central patch). The two lights to be compared illuminate the two faces of an opaque white screen, these faces being reflected into two faces of the aforesaid compound prism by two mirrors. Abney, Cornu, Mascart, and Crova have employed

diaphragms of variable aperture to vary a standard illumination. The photometry of colour has been specially studied by Abney, who has attained remarkable success by combining the method of variable aperture with that of intermittent vision. Crova has modified the spectro-photometer of Glan for colour measurement.

As standard of light, that proposed by Violle—namely the light emitted by a square centimeter of platinum at its melting-point—though nominally adopted as an international unit, has not received any cordial practical acceptance owing to the extreme difficulty of constructing a practical apparatus for producing it. The standard pentane flame of Vernon Harcourt and the amyl-acetate flame of Von Hefner have been widely used as standards. Abney's researches showed that the surface of incandescent carbon in the positive (crater) surface of the electric arc is always of a uniform quality of intrinsic whiteness. S. P. Thompson, who pointed out that this phenomenon is the necessary result of the circumstance that volatilization of carbon occurs at a fixed temperature, has proposed as a standard unit of white light the light emitted by one square millimeter of the crater surface. This is (with pure carbon) about equal to sixty-five of the old standard candles. Trotter has devised a horizontal photometer for measurement of street illumination and kindred purposes.

For measurement of the refractive powers of solids and liquids refractometers have been devised upon Wollaston's method of observing the angle of total reflexion. Of these the most convenient is that of Bertrand, and the most elaborate that of Pulfrich. Little has been done to modify the goniometer or the spectrometer. The immense improvements made in the construction of diffraction gratings by Rutherfurd (New York), and then pre-eminently by Rowland, have resulted in the adoption of these instead of prisms in much spectrographic work, especially for the production of photographed spectra. Rowland's concave gratings mark a new era in the development of spectrography.

For lens-measurements the spherometer has received numerous modifications. A. M. Mayer has devised a well-spherometer for measuring curvatures of small radius; and other instruments on the same plan have been designed by Czapski. S. P. Thompson has constructed a direct-reading dioptric spherometer; and a very

convenient commercial instrument designed by Brayton, has been introduced by the Geneva Optical Co., of Chicago, for measuring spectacle-lenses. For the measurement of the focal power of lenses and lens combinations special focometers have been constructed by Cornu, Mergier, and S. P. Thompson. The apparatus of the last-named determines the positions of the two optical centres (Gauss points) as well as those of the principal foci. For ophthalmoscopic work many new forms of ophthalmometer have been devised, notable amongst them being those of Juler and of Couper. Brashear and others have specially studied the measurement of astigmatism.

Projection apparatus has long since passed beyond the crude patterns of the old magic lantern. Even the refined apparatus of Duboscq is now superseded. Very excellent apparatus is now constructed by various houses in France and Germany, but few can compete with the apparatus designed by Lewis Wright and constructed by Newton (London), whose projection microscope is a remarkably perfect instrument. For less ambitious purposes the sciopikon, an American pattern of lantern, with double or triple paraffin lamp as illuminator, has been widely adopted in Europe.

Apparatus for the polarization of light has not developed much, mainly in consequence of the serious dearth of calc-spar. Modifications in the Nicol prism have been made by S. P. Thompson to give greater angular breadth of field, and by Mr. C. D. Ahrens to economize spar. Ahrens has built up triple and multiple prisms, so attaining large aperture with small pieces of spar. Polarimeters for the estimation of sugar and of alkaloids have been brought to a great pitch of perfection. The "half-shadow" instruments of Laurent (of Paris) and of Lippich (constructed by Schmidt and Haensch, of Berlin) are superseding the older forms of Soleil.

Immense strides have been taken in the development of the photographic camera, much attention having been given by opticians both in Europe and in America to the production of lenses that combine wide aperture with freedom from distortion of the image. Most recently attention has been given to telescopic camera lenses; special combinations for this purpose having been devised by Dallmeyer (London) and by Jarret (Paris).

In the construction of large astronomical telescopes much has

been done. The telescope of the famous Lick Observatory is a fine example of modern work. The mirror of a larger reflector than any previously produced has been recently constructed by Mr. A. A. Common (London). It is impossible here to do justice to special instruments of either American or European manufacture.

In microscopic work a most notable stimulus has been furnished by the introduction by Messrs. Zeiss (Jena) of their "apochromatic" lenses, the wonderful performance of which is due to the high degree to which the corrections for secondary aberrations have been carried. To this end the new special glasses made by Messrs. Schott (of Jena) have been employed in conjunction with white fluor spar, a material which, having a very low dispersive and refractive power, facilitates the colour-corrections whilst diminishing both the spherical aberration and the chromatic differences of the spherical aberration. Amongst the concomitant improvements are greater width of angular aperture and better illumination. Improved objectives have also been produced by Reichert (Vienna), and by London makers such as Powell and Lealand, R. and J. Beck, and Ross. As mentioned above, Messrs. Newton (London) have greatly improved the projection microscope, and have produced a remarkably perfect instrument with electric illumination and polarizing adjuncts.

Acoustical Instruments.—Little or no change has been made in acoustical instruments of precision in recent years. The standard tuning-forks made by Rudolph Koenig, of Paris, still maintain their unapproached excellence. Dr. Koenig has lately completed the fine collection of forks, from the lowest to the highest range of pitch, which, under the name of the Tonometer, has occupied his energies for some years past. None of the electrically self-sustained tuning-forks have proved reliable as standards of pitch, their forced vibrations not being independent of the driving power. The new sonometer of Leconte Stevens is an improvement on the Marloye type. Lord Rayleigh's whistles for producing tones above the limit of ordinary audition are instruments of research rather than of precision.

Meteorological Instruments.—The main progress of recent years in meteorological instruments has been in the direction of perfecting self-recording instruments. The self-recording barometers (aneroid) of Messrs. Richard Bros., of Paris, are quite extensively used. The method of electrically transmitting and recording the indications of

meteorological instruments at regular intervals throughout the day and night received an impetus from the devices of the late M. Van Rysselberghe, Brussels; but recording barographs and thermographs, as well as recording magnetic instruments, have been in use for many years at the Kew Observatory, and at other official observatories of various countries.

Instruments for Measurement of Heat.—Thermometers of precision are now much more accessible. The issuing of certificates, as practised at the Kew Observatory (London), at the Bureau of Weights and Measures (Paris), at the Reichsanstalt (Berlin), and at its *annexe* at Weimar, has tended greatly to raise the average quality of manufacture. At the two establishments in Germany alone upwards of 50,000 thermometers (mostly clinical) were tested and certified in 1892. Improvements have been made in the selection from amongst the new kinds of glass manufactured by Schott (Jena), of a glass that after heating shows no residual expansion. Recently the substitution by Ramsay of the liquid alloy of potassium and sodium in place of mercury has permitted the construction of instruments reading up to 500° C. The Reaumur scale is fast disappearing from Mid-Europe in favour of the Centigrade scale. Hydrogen thermometers for absolute measures are now preferred to air-thermometers. Metallic thermometers (of the Breguet type) have been practically disused owing to their uncertain readings. For the measurement of high temperatures, the spectro-photometer has been tried, but is not in general use. The thermo-electric pyrometer of Le Chatelier (platinum and platinum-rhodium couple) in conjunction with a dead-beat galvanometer has proved an admirable instrument. It has been made self-recording by Roberts-Austen. Pyrometers depending on the increase with temperature of the electric resistance of platinum wires are also in favour. For the measurement of radiated heat, Langley's bolometer has done good service; but even this wonderfully sensitive instrument has been out-distanced by the radiomicrometer of Vernon Boys. The latter instrument is of the same type as the more primitive thermo-galvanometer of D'Arsonval. The extreme delicacy of Boys' instrument is partly dependent on the use of more powerful magnets, but mainly on the application of exquisitely fine fibres of quartz for suspending the moving parts. Thermostats for automatically maintaining constant temperatures have come into ordinary commercial use.

DEPARTMENT L.

LIBERAL ARTS—EDUCATION, LITERATURE, ENGINEERING, PUBLIC WORKS, MUSIC, AND THE DRAMA.

Unless otherwise stated, the Exhibits in this Department are in the Manufactures Building (Gallery).

GROUP CXLVII.

PHYSICAL DEVELOPMENT, TRAINING, AND CONDITION—HYGIENE.

480 Amines Syndicate, Limited, 101 *Leadenhall Street, London, E.C.*

Working model illustrating a system of treatment and disposal of sewage and other foul or waste waters, and of producing therefrom a portable fertilizer, also samples of a new disinfectant.

480a Commissioners of Sewers of the City of London (The Honourable the), Guildhall.

Maps, drawings, photographs, and plans, in reference to method of street cleaning and removal of refuse, sewers, subways, underground lavatories, fire hydrants, artisans' dwellings, the city mortuary, and the city cemetery; models showing construction of subways under Holborn Viaduct and its approaches.

481 Cremation Society of England (The), 8 *New Cavendish Street, London, W.*

Photographic views of the Crematorium at St. John's, Woking, Surrey, the property of the Society.

482 Ewing, Robert, 19 *Great George Street, Westminster, London.*

"Archer" patent-jointed stoneware sewers and drains for drainage of buildings and towns.

483 Golf Company (The), 105 *South Street, St. Andrew's, Scotland.*
Golf clubs and balls.

484 International Water and Sewage Purification Co., Limited (The), 7 *Victoria Street, Westminster, London.*

Polarite for water and sewage purification; plans and models of polarite filter beds and filtering apparatus for the purification of public water supplies, plans of sewage purification works, showing how to apply polarite; polarido, a patented specially prepared filtering medium, practically everlasting.

See disinfectants and detergents, GROUP LXXXVII.

See plumbing and sanitary materials, GROUP CXX.

Allin, S. Sealy. *See* GROUP LXXXVII.

Apperley, Curtis & Co. *See* GROUP CIII.

Barry, Ostlere & Co., Limited. *See* GROUP CI.

Hooper & Co., Charles. *See* GROUP CIII.

Jeffrey & Co. *See* GROUP LXXXIX.

Lorrain, James. *See* GROUP CXXVIII.

Woollams & Co., William. *See* GROUP LXXXIX.

Zimer, F. W. *See* GROUP LXXXIII.

GROUP CXLVIII.

INSTRUMENTS AND APPARATUS OF MEDICINE, SURGERY AND PROSTHESIS.

485 Ash and Sons, Limited, Claudius, 6-9 *Broad Street, Golden Square, London, W.*

Mineral teeth, stopping or filling materials, dental rubbers, instruments of all kinds used by dentists, including extracting forceps, scalers, enamel cutters, nerve instruments, burring engines, burrs and drills, excavators, stoppers or pluggers, spatulas, burnishers, mouth mirrors, syringes, also an assortment of dental tools and sundries; electric lamp with switches for dentists' use.

486 Cruickshank, Arthur B., 24, *Great Western Road, Westbourne Park, London, W.*

"Vonda" syringes.

487 English Dental Speciality Company, Limited (The), *Clyncdale, New Barnet, Hertfordshire.*

Various appliances and apparatus used in dentistry.

488 Fournet, A., 18, *Bentinck Street, Welbeck Street, London, W.*

Compound ophthalmic refractometer.

See also drugs, GROUP LXXXVII.

See also meat extracts, GROUP VI.

Christy & Co., T. *See* GROUP LXXXVII.

Harper, Thomas. *See* GROUP CVI.

St. John Ambulance Association. *See* GROUP LXXXIII.

Watson & Sons, W. *See* GROUP CLI.

GROUP CXLIX.

PRIMARY, SECONDARY, AND SUPERIOR EDUCATION.

- 489 British Government, SCIENCE AND ART DEPARTMENT, *South Kensington, London, S.W.***

Examples of drawing, painting, modelling and design executed by art students in the National Art Training Schools, South Kensington, London, and in other schools of art in the United Kingdom, showing the principal stages of art instruction under the Department of Science and Art.

- 490 Choat, Frank, *care of Miss C. Noedel, Technical School Sandringham, Norfolk.***

Copper tray, flat chasing in pitch (own design and way of working background).

- 491 Cunningham, D. J., M.D., *Trinity College, University of Dublin.***

Selection from a series of models prepared with a view of showing the topographical relations of the brain in man and the apes; models of the cerebral hemispheres of an adult woman, new born child, a chimpanzee, and an orang-outang, removed from the cranial cavity; models illustrative of the anatomy of the fully flexed elbow joint.

- 492 Oxford University Extension, *Examination Schools, Oxford.***

Books, papers, photographs, and drawings, illustrative of the history and method of the University extension system.

- 493 School Board for London, *Victoria Embankment, London, W.C.***

Specimens of work done by pupils in the schools in writing, map drawing, designing in colours and in coloured papers, modelling in cardboard and in clay, woodwork, ironwork, brass-work, needlework, kindergarten handwork, laundry-work; specimens of school materials and appliances, including books, pictures, diagrams, scientific and other apparatus, school museum; models, plans and elevations (exhibited by T. J. Bailey, architect) of schools and class-rooms, regulations, reports.

- 494 Whitechapel Craft School, Committee of, *27 Little Alie Street, London, E.***

Set of (1) drawings, (2) models illustrating course of manual instruction for teachers and scholars of elementary schools carried out at the Whitechapel craft school.

Bacon & Co., Limited, W. G. *See* GROUP CL.

Decorative Arts Journal Co., Limited. *See* GROUP CL.

Tuck & Sons, Raphael. *See* GROUP CL.

Wilkinson, Henry D. *See* GROUP CLI.

GROUP CL.

LITERATURE, BOOKS, LIBRARIES, JOURNALISM.

495 Art Union of London, 112 *Strand*, London, W.C.

Works of art open to selection by subscribers under the terms of the Society's charter: engravings in pure line and in mezzotint, and etchings executed for the Society, and statuettes and other works in bronze, faïence and pottery, designed and executed for the Society.

496 Bacon & Co., Limited, G. W., 127 *Strand*, London, W.C.

School maps in English and Spanish, and atlases; pictures of popular trades, natural history pictures, drawing charts and cards, copybooks, fraction diagrams, astronomical diagrams; complete commercial atlas of the world.

497 Biggs, F. J., *Leadenhall Buildings*, London, E.C.

Copies of a work entitled "British Manufactures—Prices current."

498 British Art Publishers' Union, Limited (The), 7 *St. James' Street*, Haymarket, London; and 20 *East 17th Street*, New York.

Etchings, engravings and photogravures, and other publications of the firms constituting the Union, namely:—P. and D. Colnaghi; Dowdeswell and Dowdeswells, Limited; S. T. Gooden; Henry Graves & Co.; L. H. Lefèvre; Leggatt Bros.; Arthur Lucas; T. McLean & Co.; and Arthur Tooth & Sons.

499 Bushill, T. W., *Brantwood*, Coventry.

Book, entitled "Profit Sharing and the Labour Question."

500 Culleton, Leo., 25 *Cranbourn Street*, London, W.C.

Illuminated pedigree or genealogical table showing descent of a family from earliest known ancestor, and illustrating the English system of heraldry as regards the introduction of quarterings into armorial bearings.

501 Clifford & Co., C. E., 200 *Piccadilly, London, W.*

Engravings, etchings and mezzotints.

502 Decorative Art Journals Co., Limited (The), 76a and 76b *Moseley Street, Manchester.*

The "Journal of Decorative Art" and subsidiary publications, technical publications designed for the use of painters, decorators, and art workers; sketches and studies by John Thomas and Kate Rogers.

503 Engineer (The), 33 *Norfolk Street, Strand, London, W.C.*

Engravings of ships of H.M. navy, locomotives, and other subjects, and original drawings from which engravings have been products.

504 Engineering, Limited, 35 and 36 *Bedford Street, Strand, London, W.C.*

A set of 54 volumes of "Engineering," from January, 1866, to December, 1892; framed engravings selected from "Engineering"; an album of the Columbian Exposition.

505 Fine Art Society (The), 148 *New Bond Street, London, W.*
Representative in New York, Boussod, Valadon & Co., 303 Fifth Avenue.

Specimens of reproductions in mezzotint, etching, and photo-engraving, of pictures by well-known British artists.

506 Gibbons, Limited, Stanley, 8 *Gower Street, and 435 Strand, London, W.C.*

Stamps, stamp-albums, catalogues, guides, and histories of stamps.

507 Hadfield, R. A., *Fairfield, Broomhill, Sheffield.*

Book, entitled "A Shorter Working Day," being one of the Methuen series of Social Questions of To-day.

508 Hare & Co., Limited, 31 *Essex Street, W.C., and 7 Bride Court, Fleet Street, E.C., London.*

Colour-printing by Hare and Co.'s process (chromotypography); photomechanical blocks in half tone showing the various stages through which a block passes; wood engravings and drawings on wood.

509 Harrison & Son, 22 *Paternoster Row, London, E.C.*

Books printed and published by the firm.

- 510 **Illustrated London News, Limited (The)**, 198 *Strand, London, W.C.*

Facsimile of Shakespeare's house at Stratford-on-Avon, to be used as the publishing office. [Special building in grounds.]

- 511 **Johnston, W. and A. K.**, *Edina Works, Easter Road, and 16 South Saint Andrew Street, Edinburgh; 5 White Hart Street, Warwick Lane, London, E.C.*

Wall maps and illustrations, atlases, globes.

- 512 **Johnston, & Co., Limited, Ruddiman**, 26 *Charterhouse Square, London, E.C.*

School maps and illustrations.

- 513 **Leng & Co., John**, 7 *Bank Street, Dundee.*

Case of books.

- 514 **London Colour Printing Co.**, 44 *Exmoor Street, Notting Hill, London, W.*

Specimens of colour printing and of the "Million" newspaper. These examples are printed in from two to six colours at one operation. The newspaper from which they have been selected is produced on six-colour perfecting machines, and are delivered cut and folded at the rate of 10,000 copies an hour from each machine.

- 515 **Over, George E.**, *The Rugby Press, 15 High Street, Rugby.*

Printed books, including: "A Light Load," "Cricket Songs," "A June Romance" (large and small paper), "Liber Amoris" (large and small paper), "Love's Memorial," "Thistledown" (large and small paper), "Violets" (large and small paper).

- 516 **Perkins, Bacon & Co., Limited**, 69 *Fleet Street, London, E.C.*
[See Advt.]

Specimens of bank-notes, postage stamps, and similar manufactures.

- 517 **Schloss, David F.**, 1 *Knaresborough Place, Cromwell Road, London, S.W.*

Two books entitled respectively "Boot Making in East London," and "Methods of Industrial Remuneration."

- 518 **Sell, Henry**, 167 *Fleet Street, London, E.C.*

Collection of newspapers.

519 Smith & Son, C., 63 *Charing Cross, London, S.W.*

Maps and globes.

520 Tooth & Sons, Arthur, 5 and 6 *Haymarket, London, W.* [See Advt.

Artist proof engravings and etchings.

(See also Complimentary List, page xxxvi.)

521 Tuck & Sons, Raphael, 72-73 *Coleman Street, City, London.*

[See Advt.

Studies for painting or framing in colour and black-and-white, illustrated books, booklets, calendars, toy books, engravings, etchings, chromos, Christmas, New year, birthday and Easter cards, decorative art novelties.

522 Tripplin, J., 31 *Holborn Viaduct, London, E.C.*

Books on horology.

523 Virtue & Co., Limited, J. S., 294 *City Road, London, E.C.*

Specimens of etchings, engravings and photogravures in the "Art Journal."

524 Waterlow & Sons, Limited, *Great Winchester Street, London.*

[See Advt.

Specimens of printing from engraved steel and copper plates for bank notes, postage, and other stamps, bonds, bills of exchange, cheques, and other commercial and monetary forms.

525 Zaehnsdorf, Joseph, *Cambridge Works, 144-146 Shaftesbury Avenue, London, W.C.*

Bookbinding.

British Government. See GROUPS XV. and CLII.

British North Borneo Co. See GROUP VIII.

Doig & Co., William. See GROUP XCIII.

Royal Geographical Society. See GROUP CLV.

Ward & Co., Limited, Marcus. See GROUP LXXXIX.

GROUP CLI.

INSTRUMENTS OF PRECISION, EXPERIMENT, RESEARCH AND PHOTOGRAPHY,
AND PHOTOGRAPHS.

525A Loan Collection of Photographs.

Information regarding the works that are for sale may be obtained on application to the Superintendent of the Section.

1 Feast of the Roses—(5) The Messengers.

SHAPOOR N. BHEDWAR.

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| 2 | Children of the City. | A. KEIGHLEY. |
| 3 | Silver Birches, Borrowdale. | SEYMOUR CONWAY. |
| 4 | The Grey Dawn. | BERNARD ALFIERI. |
| 5 | Feast of the Roses—(1) The Flower Girl. | SHAPOOR N. BHEDWAR. |
| 6 | Feast of the Roses—(4) Confidences. | SHAPOOR N. BHEDWAR. |
| 7 | The Weir Pool. | H. P. ROBINSON. |
| 8 | Old Moreton Courtyard. | R. KEENE. |
| 9 | Worcester Cathedral. | R. KEENE. |
| 10 | Evening on Derwentwater. | SEYMOUR CONWAY. |
| 11 | After the Mid-day Meal, Derwentwater. | SEYMOUR CONWAY. |
| 12 | The House on the Marsh. | BERNARD ALFIERI. |
| 13 | The Feast of the Roses—(2) Weaving the Garland. | SHAPOOR N. BHEDWAR. |
| 14 | The Feast of the Roses—(6) Inamorata. | SHAPOOR N. BHEDWAR. |
| 15 | The Feast of the Roses—(3) Hanging the Garland. | SHAPOOR N. BHEDWAR. |
| 16 | Against the Sky. | BERNARD ALFIERI. |
| 17 | The Ball Room, Haddon Hall. | R. KEENE. |
| 18 | Springtime. | A. KEIGHLEY. |
| 19 | Haddon Hall, on the Terrace. | R. KEENE. |
| 20 | The Haunt of the Seagull. | A. KEIGHLEY. |
| 21 | The Last of the Wooden Walls. | F. COBB. |
| 22 | The Maid of the Mill. | F. HOWARD. |
| 23 | Neddy's New Shoes. | R. H. LORD. |
| 24 | The Lingering Snow. | F. HOWARD. |
| 25 | The Old Lych Gate. | F. COBB. |
| 26 | The Crabb Inn. | F. COBB. |

27	Entrance to Old Moreton Hall.	R. KEENE.
28	Saturday Afternoon.	F. M. SUTCLIFFE.
29	Water Rats.	F. M. SUTCLIFFE.
30	Whitby Harbour.	F. M. SUTCLIFFE.
31	A Clear Course.	T. G. BRIGHT.
32	Hoar Frost.	SEYTON F. SCOTT.
33	Ploughing.	W. L. COLLS.
34	Portrait.	W. J. BYRNE.
35	On the Basingstoke Canal.	W. L. COLLS.
36	A Farm on the Marsh.	G. DAVISON.
37	The Rye.	G. DAVISON.
38	In the Month of May.	E. CALLAND.
39	Sunshine and Shower.	F. M. SUTCLIFFE.
40	Twilight on the Thames.	W. L. COLLS.
41	An Approaching Storm.	W. L. COLLS.
42	An Upland Pool.	R. BRIANT.
43	A Silver Birch.	R. BRIANT.
44	Sand Dunes.	B. GAY WILKINSON.
45	A Frozen Swamp.	R. BRIANT.
46	Doorway, Old Moreton Hall.	R. KEENE.
47	On the Thames below Kew.	R. KEENE.
48	Stern Reality.	F. M. SUTCLIFFE.
49	The Dock End, Whitby.	F. M. SUTCLIFFE.
50	Kew Gardens.	SEYTON F. SCOTT.
51	Portrait.	SEYTON F. SCOTT.
52	The Blossoms.	E. CALLAND.
53	Telford Bridge.	G. DAVISON.
54	An Exposed Coast.	G. DAVISON.
55	The Saltings.	G. DAVISON.

56	Windworn.	G. DAVISON.
57	A Winter Afternoon.	G. DAVISON.
58	The Hayrick.	G. DAVISON.
59	Winchelsea Mill.	E. CALLAND.
60	Salt Marshes.	HORSLEY HINTON.
61	A Silver Strand.	B. GAY WILKINSON.
62	A Reed-fringed Mere.	R. BRIANT.
63	Salisbury Cathedral.	R. KEENE.
64	Bay Window, Banqueting Hall.	R. KEENE.
65	The Old Wife.	F. M. SUTCLIFFE.
66	Derwentwater—"Evening."	T. M. BROWNRIGG.
67	Derwentwater—"A Storm on the Lake."	T. M. BROWNRIGG.
68	"We're not Afraid."	T. G. BRIGHT.
69	Study of Greek Figure.	F. SEYTON SCOTT.
70	Sunshine, Smoke, and Seaweed.	F. M. SUTCLIFFE.
71	The Sunset.	BERNARD ALFIERI.
72	La Belle Bretonne.	A. BURCHETT.
73	The Knight.	A. BURCHETT.
74	Caller Herrin.	A. BURCHETT.
75	Sweet Seventeen.	BERNARD ALFIERI.
76	Summer Breezes.	HINTON HORSLEY.
77	Girl with Violin.	A. BURCHETT.
78	Westminster.	B. GAY WILKINSON.
79	The Village Rhymster and his Victim.	W. W. WINTER.
80	A Surrey Brook.	T. M. BROWNRIGG.
81	Hampton Court Gardens.	F. COBB.
82	Watcombe Bay, Isle of Wight.	T. M. BROWNRIGG.
83	Going Out with the Tide.	H. TOLLEY.

84	Young Bloodhounds.	GAMBIER BOLTON.
85	Great Expectations.	GAMBIER BOLTON.
86	Christmas Time.	H. TOLLEY.
87	Of Wonder in her Eyes.	GAMBIER BOLTON.
88	Dovedale in Winter.	H. TOLLEY.
89	On the Margin of Lake Killarney.	H. TOLLEY.
90	Ploughing.	A. R. DRESSER.
91	Corbiere Rocks.	A. R. DRESSER.
92	Coming in with the Tide.	H. M. HASTINGS.
93	On the Lonely Shore.	H. TOLLEY.
94	Limestone Rocks, Derbyshire.	H. TOLLEY.
95	Majesty.	GAMBIER BOLTON.
96	Out of the Marsh a Fir Tree Grew.	H. TOLLEY.
97	Sentinels of the Middle Lake, Killarney.	H. TOLLEY.
98	The Caskets.	A. R. DRESSER.
99	In Cressbrook Dale.	R. KEENE.
100	Miss Andrews.	MENDELSSOHN.
101	Professor Blackie.	W. CROOKE.
102	G. H. Mach, Esq.	W. CROOKE.
103	M. Paderewski.	W. CROOKE.
104	Mrs. Shaw Kennedy.	MENDELSSOHN.
105	In Winter's Grasp.	M. T. HARDING.
106	Queen's College Library.	COURT COLE.
107	Christchurch Cathedral Choir.	COURT COLE.
108	Lord Kingsburgh.	W. CROOKE.
109	Don Ruy Gomez.	W. R. CASSELS.
110	Lord Justice-General of Scotland.	W. CROOKE.
111	Lord Wellwood.	W. CROOKE.

112	Lord Kincairney.	W. CROOKE.
113	Lord Rutherford Clark.	W. CROOKE.
114	The Old, Old Story.	W. R. CASSELS.
115	Lord Popper.	W. CROOKE.
116	The Rehearsal.	A. DISTON.
117	Window in Christchurch Cathedral.	COURT COLE.
118	Window in Christchurch Cathedral.	COURT COLE.
119	Highland Smugglers.	A. DISTON.
120	Window in Christchurch Cathedral.	COURT COLE.
121	Window in Christchurch Cathedral.	COURT COLE.
122	Lighten Our Darkness, O Lord.	LYDDELL SAWYER.
123	A Motley Crew.	LYDDELL SAWYER.
124	A Captive Unconquered.	GAMBIER BOLTON.
125	Mackenzie, Esq.	W. CROOKE.
126	On their own Hooks.	LYDDELL SAWYER.
127	The Penny Ferry.	LYDDELL SAWYER.
128	Relics.	A. DISTON.
129	The Gloaming.	A. DISTON.
130	Where Flowers Bloom.	CLEMENT WILLIAMS.
131	My Mammy.	W. W. WINTER.
132	Comparing Notes.	W. W. WINTER.
133	Portiscull Bridge.	T. M. BROWNRIGG.
134	Flatford Bridge.	LIEUT.-COL. GALE.
135	Osier Peelers preparing for Supper.	LIEUT.-COL. GALE.
136	On the North Downs.	LIEUT.-COL. GALE.
137	The Incoming Tide.	LIEUT.-COL. GALE.
138	An Autumn Morning.	LIEUT.-COL. GALE.
139	Afternoon Rest.	LIEUT.-COL. GALE.

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| 140 | A Cottage Doorway. | LIEUT.-COL. GALE. |
| 141 | Through the Driftway. | LIEUT.-COL. GALE. |
| 142 | Deserted Homestead. | KARL GREGER. |
| 143 | June in the Fens. | KARL GREGER. |
| 144 | Homewards. | KARL GREGER. |
| 145 | The Rising Lark. | H. P. ROBINSON. |
| 146 | In the Welsh Mountains. | KARL GREGER. |
| 147 | Bognor Shore. | KARL GREGER. |
| 148 | Autumn Evening. | KARL GREGER. |
| 149 | Hoar Frost in the Valley behind the Lower Glacier,
Grindelwald. | CAPT. W. DE W. ABNEY, C.B. |
| 150 | Hoar Frost at Grindelwald. | CAPT. W. DE W. ABNEY, C.B. |
| 151 | Sunset behind the Eiger, Grindelwald (Winter), | CAPT. W. DE W. ABNEY, C.B. |
| 152 | Christmas Day, Grindelwald, 1891. | CAPT. W. DE W. ABNEY, C.B. |
| 153 | Infra-red of the Solar Spectrum to wave-length.
(10,000 taken with a defraction grating, 1880.) | CAPT. W. DE W. ABNEY, C.B. |
| 154 | The Finsteraarhorn from the Büsalp, Grindelwald. | CAPT. W. DE W. ABNEY, C.B. |
| 155 | The Valley of Grindelwald from the Büsalp—"A Coming
Snowstorm." | CAPT. W. DE W. ABNEY, C.B. |
| 156 | Hoar Frost at Grindelwald. | CAPT. W. DE W. ABNEY, C.B. |
| 157 | The Wetterhorn from the Fanthorn Path, Grindelwald
(Winter). | CAPT. W. DE W. ABNEY, C.B. |
| 158 | Frost and Sunshine. | E. MAIN. |
| 159 | In the Land of Dreams. | W. R. CASSELS. |
| 160 | Mont Blanc by Moonlight, 7th January, 1893, 10 p.m. | CAPT. W. DE W. ABNEY, C.B. |
| 161 | Japanese Anemones. | H. STEVENS. |

162	Carolling.	H. P. ROBINSON.
163	Meadow Sweet.	H. STEVENS.
164	The Ferry.	LIEUT.-COL. GALE.
165	Sleepy Hollow.	LIEUT.-COL. GALE.
166	Homewards from Plough.	LIEUT.-COL. GALE.
167	Granny's Counsel.	R. TERRAS.
168	News of the Battle.	R. TERRAS.
169	Ladies in Court Dress (At-home Photos).	W. J. BYRNE.
170	The Findlen Glacier.	W. ENGLAND.
171	Orchids and Foliage.	H. STEVENS.
172	Gossip on the Beach.	H. P. ROBINSON.
173	Roses.	H. STEVENS.
174	View at Chamounix.	W. ENGLAND.
175	Hoar Frost in the Valley, Chamounix.	CAPT. W. DE W. ABNEY, C.B.
176	Dome du Goute et le Glacier.	W. ENGLAND.
177	View on the Riffleberg.	W. ENGLAND.
178	"How's That?"	R. H. LORD.
179	Yacht Racing—"Mohawk."	G. WEST.
180	Try Again.	R. H. LORD.
181	Mr. E. J. Leveson.	H. H. HAY CAMERON.
182	Mr. Henry Hetherington.	H. H. HAY CAMERON.
183	Florence.	J. M. CAMERON.
184	The Nestling Angel.	J. M. CAMERON.
185	Homer (Harry Bates).	F. HOLLYER.
186	The Day Dream.	J. M. CAMERON.
187	Maud—The Passion Flower at the Gate.	J. M. CAMERON.
188	Lady Catherine Thynne.	H. H. HAY CAMERON.
189	A New Pet.	R. ROBINSON.

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| 190 | A Sudden Squall. | R. ROBINSON. |
| 191 | Dying Day. | R. ROBINSON. |
| 192 | Dante's Dream. | F. HOLLYER. |
| 193 | Love and Death (F. Watt). | F. HOLLYER. |
| 194 | Love among the Ruins. | F. HOLLYER. |
| 195 | Making Friends. | R. ROBINSON. |
| 196 | At Arundel. | A. R. DRESSER. |
| 197 | Sweet Springtime. | R. ROBINSON. |
| 198 | The Holy Family (Bottecelli). | F. HOLLYER. |
| 199 | The Avenue (Hoblema). | F. HOLLYER. |
| 200 | Evening on the Vienne. | F. HOLLYER. |
| 201 | Feeding the Ducks. | R. ROBINSON. |
| 202 | An Invitation to Supper. | VAN DER WEYDE. |
| 203 | Miss Julia Neilson in Hypatia. | VAN DER WEYDE. |
| 204 | Mr. Beerbohm Tree and Miss Olga Brandon in Hypatia. | VAN DER WEYDE. |
| 205 | Portrait Group (The Misses Dene). | VAN DER WEYDE. |

526 Baker, A. P., 57 Deansgate, Manchester.

Collection of photographic views, taken direct, size 23 by 18, printed in platinotype, of the Royal Jubilee Exhibition, Manchester, 1887, Paris Exhibition 1889, and Jamaica Exhibition, 1891.

527 Beck, R. & J., 68 Cornhill, London, E.C.

Photographic and microscopical optical apparatus.

528 Billington & Co., H., Augatella, Queensland.

Photographs showing the workings of Queensland sheep and cattle stations, with other pictures of general interest to the pastoral portion of the colony.

529 Brown Brothers, 101 Greville Road, Bristol.

Self-adjusting level and gradient indicator; indicates at a glance and without adjustment or the use of any formulæ all grades from level to perpendicular, also shows degrees from 5 to 90, fitted with sight points for surveying.

530 Byrne, W. J., *Richmond, Surrey.*

Photographic portraits, taken direct from life; enlargements of same.

531 Cameron & Smith, *70 Mortimer Street, Regent Street, London.*

Photographs of Lord Tennyson and his friends.

532 Common, A. A., *63 Eaton Rise, Ealing, London, W.*

Parabolic mirror in cell, for silver-on-glass Newtonian telescope.

533 Darton & Co., F., *St. John Street, London, E.C.*

Meteorological instruments, aneroid and mercurial barometers, thermometers and instruments for scientific research.

534 Dore, J., *27 High Street, Sandown, Isle of Wight.*

Photographic lantern transparencies.

535 Downer, Fredk., *Blake House, Watford.*

Photographs.

536 Flather, Henry, *242 Queen's Road, London, S.E.*

Series of "dry point" or needle-finished carbon and other enlargements, and direct photographs.

537 Godbold, Henry James, *25 White Rock Place, Hastings.*

Photographs.

538 Grubb, Sir Howard, F.R.S., *Dublin.*

Working model of first-class astronomical observatory, illustrating some novel labour-saving contrivances; small equatorial instrument (new design); photographs and engravings of standard instruments erected.

539 Lafayette, J., *Dublin, Glasgow, and Manchester.*

Photographs taken direct from life, printed in platinum and carbon.

540 Lemere & Co., *Bedford, 147 Strand, London, W.C.*

Architectural photographs, modern English mansions, showing elevation, interior decoration, fittings, and furniture.

541 Lawrence, William, 5, 6 and 7 *Sackville Street, Dublin*.

Photographic views of scenery and antiquities of Ireland; portraits of noted Irishmen; magic lantern slides of Irish scenery.

542 Mendelssohn, H. S., 14 *Pembridge Crescent, London, W.*

Portraits, painted and photographed.

543 Oeffelein & Co., 54 *Berners Street, Oxford Street, London, W.*

Burnt-in photographs on glass, china, enamel.

544 Rein & Son, F. G., 108 *Strand, London, W.C.*

Acoustic and scientific instruments.

545 Riley Brothers, *Bradford, Yorkshire*.

[See Advt.]

The "Invicta" tri-unial and "Superb" bi-unial optical lanterns, "Præstantia," "Premier," and "Triumph" single optical lanterns, electric lamp for optical lanterns, plain and coloured lantern slides, and other lantern accessories.

546 Roche, Charlotte, 27 *Cheyne Walk, London, S.W.*

Photographs: Bobby and Olive, grandchildren of Charles Dickens; Alice; John Burns in 1888; The Workshop; Poor Little Willy; A Copper, Please; Thank You; Venetian well; Rowing; A gondolier; Three bridges in Venice; Fisher boats.

547 Ross & Co., 112 *New Bond Street, London, W.*; *Works, Clapham Common, London, S.W.*

[See Advt.]

Photographic lenses, cameras, and apparatus, new patent concentric lens; naval and sporting telescopes, special telescope for gun directors, field and opera glasses; microscopes and apparatus, new series objectives, binocular high power prism for microscopes.

548 Sawyer, Lyddell, *Singleton House, Newcastle-on-Tyne*.

Photographs: The Toper; The Boat-BUILDER; Reflections; The Last Rehearsal. The Smoky Tyne; "On their Own Hooks"; On the River Tyne; Rare Old Gossips; Crewel (Cruel!) Work In the Twilight; The Castle Garth; Newcastle; Foggy Weather.

549 Symonds & Co., 39 *High Street, Portsmouth*.

Photographs of ships of the British Navy, and yacht racing scenes.

550 Van der Weyde, Henry, 182 *Regent Street, London, W.*

Portraits by system of reflected electric light, invented and used by exhibitor since 1877 to the exclusion of all daylight; decorative enlargements, panels; the "Photo Corrector," recently invented by exhibitor, examples in pairs, showing corrections it is possible to make by this refracting instrument.

552 Warneuke, W. M., 153 *Sauchiehall Street, Glasgow.*

Photographs.

553 Watson & Sons, W., 313 *High Holborn, London, W.C.*

Photographic lenses and cameras; microscopes and microscopical apparatus and accessories, prepared objects for the microscope; optical and dissolving view lanterns; astronomical and terrestrial telescopes, binocular and other glasses, barometers, thermometers; surveying, engineering, and mathematical instruments.

554 Werner & Son (Alfred Werner), 39 *Grafton Street, Dublin.*

Photographic portraits.

555 Wilkinson, Henry D., *St. Mary's Chambers, Cardiff; and 79 Mildmay Road, London, N.* [Mach. B.]

An instrument designed to show with precision the action of valves in steam and other engines, under all possible modifications of angular advance, travel, width, and position of ports, all such modifications being capable of precise measurement.

556 Williams, W. Clement, 13 *Akeds Road, Halifax, Yorkshire.*

Direct photographs (prints in carbon): The Lonely Ocean; A Silent Shore; A Sea Dream; A Calm; The Sparkling Sea; A Gathering Storm; Break on, thou Restless Sea; Shades of Evening.

557 Window & Grove, 63 *Baker Street, London, W.*

Photographs.

558 Winter, W. W., *Midland Road, Derby.*

Photograph studies, taken direct, printed in platinotype.

559 York & Son, 67 *Lancaster Road, Notting Hill, London, W.*

Photographic optical lantern slides for projection by the optical or magic lantern.

See also clocks and watches, GROUP XCIX.

See also electric apparatus, Department J.

See also measures, GROUP CXII.

See also testing machines, GROUP LXXVII.

Besson & Co., F. *See* GROUP CLVIII.

Bryer & Son. *See* GROUP LXXXV.

Royal Microscopical Society. *See* GROUP CLV.

GROUP CLII.

CIVIL ENGINEERING, PUBLIC WORKS, CONSTRUCTIVE ARCHITECTURE.

560 Allin, Samuel Sealy, 25 Garlick Hill, London, E.C.

Invisible pneumatic door closer for single and double acting doors.

561 British Government GEOLOGICAL SURVEY OF THE UNITED KINGDOM, 28, Jermyn Street, London, S.W.

A.—Geological maps, scale 1 inch to 1 mile ($\frac{1}{63} \cdot \frac{1}{360}$):—1, Isle of Wight; 2, Environs of London, showing the superficial deposits; 3, Ditto, showing the solid rock formations below the drift; 4, Part of N. Wales; 5, Part of the Yorkshire coal-fields; this map is further illustrated by 5a and 5b, horizontal section, both on 6-inch scale, and by 5c, vertical section, scale 1 inch to 40 feet; 6, N. of Ireland; 7, S. of Scotland. B.—Index maps, scale 1 inch to 4 miles ($\frac{1}{253} \cdot \frac{1}{440}$):—9, Neighbourhood of London and lower part of Thames basin; 10, Part of Wales. C.—Memoirs illustrating maps 1—7; general memoirs on Pliocene Deposits, the Pliocene Vertebrata, and the Jurassic Rocks of Great Britain.

562 British Government, ORDNANCE SURVEY OF GREAT BRITAIN AND IRELAND, Southampton.

One in. outline map, and 1 in. hill map of part of Scotland, each 10' 3" × 9' 3" engraved; 1 in. hill map of part of Ireland, 3' 3" × 2' 3" engraved; town plan, on $\frac{1}{500}$ scale, cadastral plan, on $\frac{1}{2500}$ scale; two maps, on 6 in. scale, one engraved, one photo-zincographed; various unmounted specimens of the maps and plans.

563 Cheesewright, Frederick Henry, 60 Haymarket, London, S.W.

Model of a new system of pier and break-water construction.

564 Culpin, Arthur, 1 Sidbury, Worcester.

Reversible and removable window sashes.

565 Ebner, Joseph Francis, 150 Old Street, St. Luke's, London, E.C.

Specimen illustrating Ebner's patent hydrofuge system of attaching parquet or other wood flooring to a concrete foundation, for fireproof and other constructions.

566 Etefas Window Co., 34 New Bridge Street, London, E.C.

Sliding windows, which also swing inwards for safe outside cleaning, painting.

567 Sim, John, Architect, Montrose, Scotland.

Patent windows.

568 Trinity College, University of Dublin. [Transp. B.]

Model of shield used by Brunel in the construction of the Thames tunnel.

See also architecture, DEPARTMENT K.

See also architectural pottery, GROUP XCI.

See also mine engineering, GROUP LXVII.

See also railway engineering, GROUP LXXX.

Commissioners of Sewers of the City of London. *See*
GROUP CXLVII.

Main, Thomas. *See* GROUP XXVI.

Flynn & Co., Thomas M. N. *See* GROUP XLIV.

GROUP CLIII.

GOVERNMENT AND LAW.

5 9 Hinton, Thomas Henry, 5 Paulton's Square, Chelsea, London, S.W.

Some of the postage stamps, envelopes and cards issued in the British Empire from 1840 to 1893, including the Mulready and Jubilee envelopes, first adhesive stamps, cards and wrappers of Great Britain and stamps of the British Colonies.

British North Borneo Co. *See* GROUP VIII.

Gibbons, Limited, Stanley. *See* GROUP CL.

Perkins, Bacon & Co., Limited. *See* GROUP CL.

GROUP CLIV.

COMMERCE, TRADE, AND BANKING.

570 Drew & Cadman, 245 and 246 *High Holborn, London, W.C.*

Air-tight plate-glass show cases in ebony and hardwood frames, air-tight frames and sashes, plate-glass table cases, mahogany counters and stands of all kinds, window fittings specially prepared for exportation.

See railway and transportation companies, DEPARTMENT G.

British North Borneo Co. *See* GROUP VIII.

Chubb & Sons' Lock and Safe Company, Limited. *See* GROUP CXIX.

Perkins, Bacon & Co., Limited. *See* GROUP CL.

Waterlow & Sons, Limited. *See* GROUP CL.

GROUP CLV.

INSTITUTIONS AND ORGANIZATIONS FOR THE INCREASE AND DIFFUSION OF KNOWLEDGE.

570a Hakluyt Society, 4 *Lincoln's Inn Fields, London, W.C.*

Set of publications of the society from 1848 to 1892.

571 Marine Biological Association of the United Kingdom, *The Laboratory, Citadel Hill, Plymouth.*

A treatise on the common sole, by J. T. Cunningham, M.A.; published by the Association, 1890; view of the laboratory; and account of the Association.

- 572 Royal Geographical Society, The** (founded 1830), 1 *Savile Row, Burlington Gardens, London, W.*

Selection of the society's publications, illustrating the progress of exploration and the advancement of geographical science; a map showing English discovery and exploration in North America.

- 572^A Royal Microscopical Society**, 20 *Hanover Square, London, W.*
Photomicrographs.

- 573 Vegetarian Federal Union (The)**, *Memorial Hall, Farringdon Street, London, E.C.*

Publications, diagrams and specimens relating to vegetarianism, health, and temperance.

GROUP CLVI.

SOCIAL, INDUSTRIAL AND CO-OPERATIVE ASSOCIATIONS.

- 574 Bradford Coffee Tavern Company, Limited**, *Westgate, Bradford, Yorkshire.*

Views of the principal establishments, and letterpress account of the work.

- 575 Bureau of Charities, Correction, and Philanthropy (ENGLISH GROUP).**

Charts: I.—Government and supervision of charitable and penal institutes; II.—Institutions under State control; III.—Institutions under County and Municipal control; IV.—Institutions under private control; V.—The delinquent classes of the State; VI.—Hospitals in cities; VII.—Police force.

Introductory notices: Division A, Lunacy; B, Hospitals, C and D, Private charities, other than hospitals; D, Poor Law; E, Prisoners and police.

Samples of work, &c.

Official statistics, reports and literature. Divisions A.—Lunacy and lunatic asylums; B.—Surgical aid, dispensaries and nursing institutions, hospitals and convalescent homes; C.—Homes for the employed, homes for children (unemployed), day nurseries, reformatories, industrial and truant schools; D.—Pension societies,

shelter, relief in money, relief in kind, benevolent institution employment; poor law institutions, homes for the aged, institutions for the blind, deaf and dumb, cripples, incurables; E.—Prisons and police, penitentiaries for women, prisoners' aid societies; F.—Emigration, associations for social improvement, associations for protection of helpless classes.

Smith & Son, Turberville. *See* GROUP CIII.

Thomson & Sons, Limited, William. *See* GROUP CIII.

GROUP CLVII.

RELIGIOUS ORGANIZATIONS AND SYSTEMS—STATISTICS AND PUBLICATIONS.

576 Religious Tract Society, 56 *Paternoster Row, London, E.C.*
Books, periodicals, Scripture cartoons.

577 Sunday School Union (The) (*founded 1803*), 57 & 59 *Ludgate Hill, and (benevolent department) 56 Old Bailey, London, E.C.*

Sunday school teachers' text-books, lesson helps, reward books and cards, school library books, elementary and advanced educational works, maps, models, music for church, school, and home. illuminated texts and wall decorations, and Sunday school requisites.

GROUP CLVIII.

MUSIC AND MUSICAL INSTRUMENTS—THE THEATRE.

578 Augener & Co., 86 *Newgate Street, E.C., and 1 Foubert's Place, Regent Street, W., London.*

Printed music books :—Comprising educational works, collections of the old masters, classics, Romanticists, and modern writers in all possible combinations for all instruments, full orchestral scores, catechisms and dictionaries of music, books on history and theory of music, harmony, counterpoint, fugue, instrumentation, portraits of the great composers.

- 579 Besson & Co., F.**, 198 *Euston Road, London, N.W.*; *Fourth Avenue, New York*; and 96 *Rue d'Angouleme, Paris*.

[Ground floor.] [See Advt.]

Patent "Prototype" wind instruments and system of manufacture (U.S. patents). "Victory" compensator-transpositor series cornet to bass, double air column. "Pedal" contrabass clarinet, completing clarinet family. "Cornophones," new family brass wind, voice between reed and brass. Improved saxophones. Means of transposition and compensation. Duplex instruments and others illustrating pitches of all nations. Clear bore valves.

- 580 Bishop & Sons, E.**, *Belmont Street, Chalk Farm Road, London, N.W.*

[See Advt.]

Upright iron grand pianofortes.

- 581 Erard, S. & P.**, 18 *Great Marlboro' Street, London, W.*

[See Advt.]

Models representative of Messrs. Erard's manufacture from 1811 (date of Sebastian Erard's patent for double action harps) till present time; Grecian harp, 43 strings, Gothic harps, 46 strings (entirely superseding Grecian), various models and designs; the harp presented by the Welsh people to H.R.H. the Prince of Wales, old Welsh 3 string model; the Prince of Wales' harp, Erard model.

- 582 Higham, Joseph**, 127 *Strangeways, Manchester*. [Ground floor.]

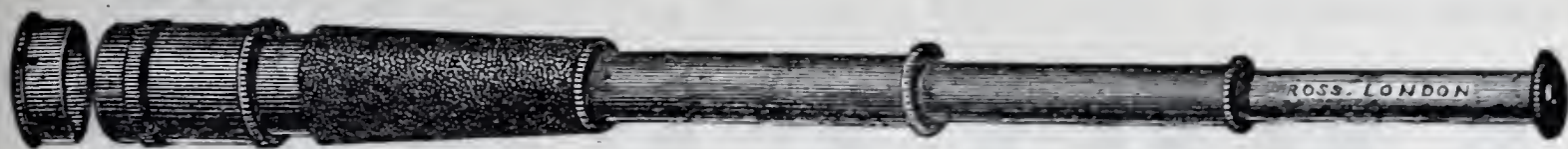
Brass, engraved and electro-plated musical instruments.

- 583 Rudall, Carte & Co.**, 23 *Berners Street, London, W.*

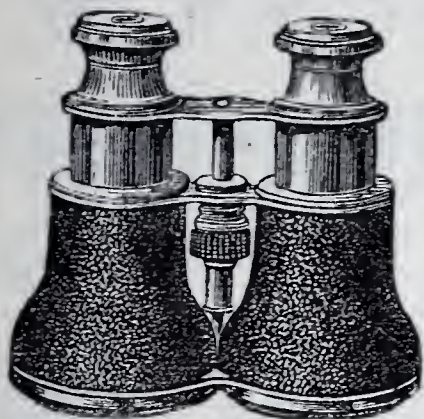
Military and orchestral instruments (wood and brass).

Musselburgh Wire and Steel Works. See GROUP LXXXV.

Sunday School Union. See GROUP CLVII.



*Gold Medals and Highest Awards at
all great International Exhibitions.*



ROSS & CO.,

Manufacturing Opticians,

INVITE VISITORS TO THE

WORLD'S COLUMBIAN EXPOSITION

To Inspect their Celebrated and Improved

PHOTOGRAPHIC LENSES

AND

CAMERAS,

MICROSCOPES AND

NEW SERIES OBJECTIVES,

Naval and Military

TELESCOPES & BINOCULAR GLASSES

AND OTHER NOVELTIES.

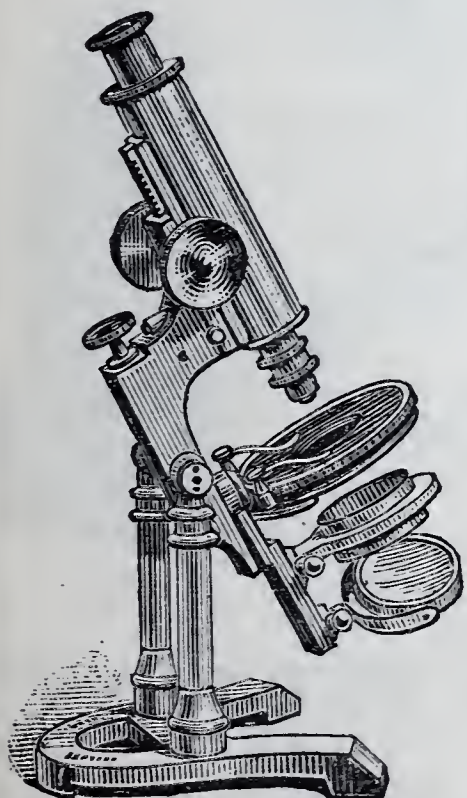
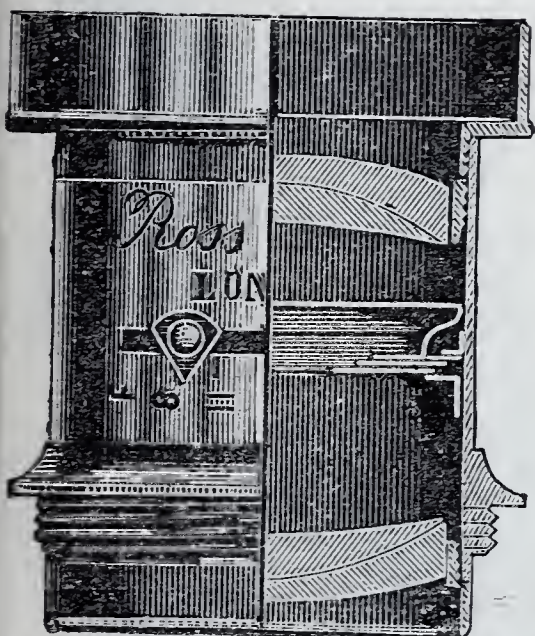


EXHIBIT No. 547.

Group 151. Department L.

Manufactures and Liberal Arts Building,
Jackson Park, Chicago.

ROSS & CO.,

111, NEW BOND STREET, LONDON, ENG.

Agents in Chicago: THE GENEVA OPTICAL CO., 67, WASHINGTON STREET.

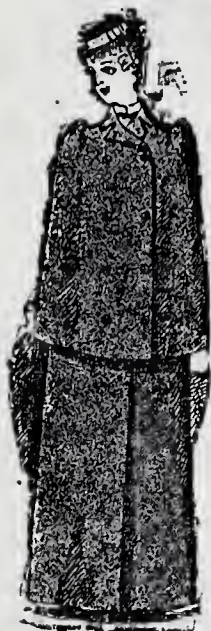
SEE EXHIBITS, NOS. 451 IN MANUFACTURES, 95 IN FISHERIES.

ANDERSONS'

HIGH CLASS
LADIES' WATERPROOFS

FOR ALL
PURPOSES AND
CLIMATES.

THIRTEEN
PRIZE MEDALS
AWARDED.



The
"DECIMA."

Fishing
Waterproofs.



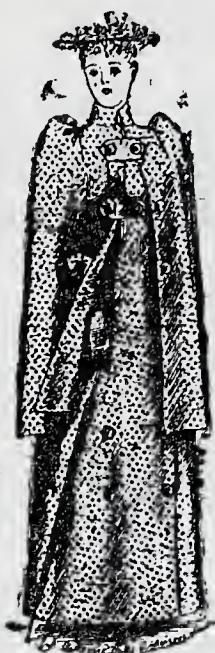
The "BRAEMAR"
(Registered Rd 92786.)
COSTUME.

CHILDREN'S
✦
WATERPROOFS.

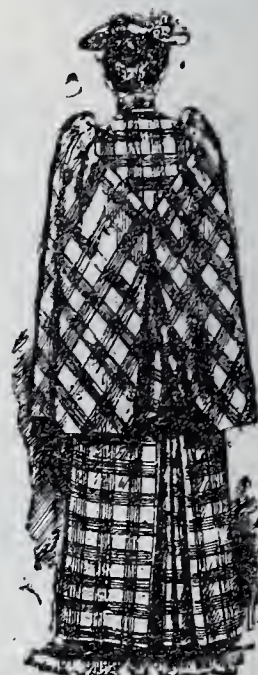


The
"REHAN."

Driving
Waterproofs.



Front.
The "ZARA."



Back.
The "ZARA."

Riding
Waterproofs.

Yachting
Waterproofs.



The
"OPHELIA."



The LADIES'
"ADMIRALTY."
(A Fitting Ulster with Detachable Cape.)



The
"DUDLEY."

ANDERSON, ANDERSON & ANDERSON

37, QUEEN VICTORIA STREET, LONDON, E.C.

35, ST. PAUL'S CHURCHYARD, LONDON, E.C.

WORKS—BOW, LONDON, E.

SEE INSIDE FRONT COVER AND PAGE 49 FOR FURTHER ADVTS.

Department M.

ETHNOLOGY, ARCHÆOLOGY, PROGRESS OF LABOUR AND INVENTION.

WOMEN'S WORK COMMITTEE.

BY MRS. FAWCETT.

The object of this Committee has been to collect such a series of exhibits as would form, within certain limits, a fair representation of English women's work in various fields of activity. The selection of the Committee has been strictly confined by the Commission to the work of women; hence nearly the whole field of ordinary industry in which men and women work in co-operation with one another has been excluded. For instance, the textile industries, in which about two-thirds of the persons employed are women and girls, cannot be included, because in all of these men and women work together. Women's work as designers has also been excluded where, as frequently happens, the design is executed by male artificers. On the other hand, work exclusively done by female fingers, such as the manufacture of hand-made carpets, does not find a place in the Women's Work Section if the design has been supplied by a man. In many respects, therefore, the Women's Work Committee have been confronted by difficulties and restrictions which would not have arisen if practical attention had been given to the maxim: "Whom God hath joined together, let not man put asunder."

There are, however, a few handicrafts and some other occupations wholly in the hands of women. Some of the more suitable of these have been selected for the purpose of exhibition. The Committee have endeavoured, within the limits just referred to, to carry out the desire expressed to them by Mrs. Potter Palmer, when she addressed them in London last summer and explained that it was

the wish of the Board of Lady Managers to gather together at Chicago a record of what women had done.

The field of Women's Work may be divided roughly under two heads—

1. Occupations that have been from time immemorial in the hands of women.
2. Occupations in which women have taken an active part only within comparatively modern times.

The distinction, however, is perhaps more apparent than real, because the same spirit which has caused women to enter upon new fields of activity has also caused them to do their old work with such greatly increased knowledge and thoroughness as to invest it, practically, with new life. There is as great a gulf between the Mrs. Gamp of half-a-century ago and the trained nurse of to-day; between the governess of half-a-century ago—who taught all the arts and sciences, as well as deportment and “the use of the globes”—and the high school teacher of to-day; as there is between Mrs. Squeers, with her daily administration of brimstone and treacle, and the woman doctor of to-day. It is not merely that new employments have been introduced, but that the old have been made new by the new spirit breathed into them.

Before speaking in detail of the exhibits of the various subsections, the Committee wish to call special attention to the collection of Royal exhibits graciously contributed by Her Majesty the Queen, H.R.H. the Princess of Wales, H.R.H. the President, and other ladies of the Royal family. The paintings contributed by Her Majesty the Queen and ladies of the Royal Family are placed amongst the other pictures on the walls of the Women's Building. Other work contributed by the Royal Family is to be found in a special case prepared for the purpose.

The principal departments of Women's Work selected by the Committee for illustration are as follows :—

<i>Lace</i>	. . . . .	Her Grace the Duchess of Abercorn.
<i>Embroidery and Needlework</i>	. . .	Lady Henry Grosvenor.
<i>Handicrafts</i>	. . . . .	Lady Roberts.

<i>Artistic decorations in vestibule</i>	Mrs. Roberts Austen.
<i>Scottish and Irish Domestic Industries</i>	The Countess of Aberdeen.
<i>Welsh Domestic Industries</i>	The Lady Aberdare.
<i>Literature</i>	Mrs. Gordon.
<i>Nursing and Hygiene</i>	Mrs. Bedford Fenwick.
<i>Philanthropic Work</i>	The Baroness Burdett-Coutts.
<i>Education (including Medical Education)</i>	Mrs. Fawcett.

A few words are called for on the subject of each of these sub-sections. In the departments of Lace, Embroidery and Needlework, it must be confessed that the women of the present day are very inferior artificers to their predecessors in bygone centuries. Nevertheless, the present generation has seen a not unimportant revival of artistic needlework in all its branches, influenced mainly by the school of design and colour of which Mr. William Morris is the most eminent representative. One of the chief results of this revival is to be found in the Royal School of Art Needlework, which sends a valuable contribution to the Exhibition. In the Handicrafts sub-section the restrictions previously alluded to have hampered the action of the Committee more seriously than in any of the other sub-sections. Every spectator must remember that the exhibit does not at all fully represent women's work in the ordinary industrial sense of the words: because, in consequence of the great sub-division of labour which characterises modern industry, comparatively few of the ordinary articles of commerce are made by men only or by women only, but by men and women working in co-operation. One interesting feature of this exhibit is to be found in the models of patented inventions taken out by women. The number of women patentees has increased very rapidly during recent years. This is probably due in part to better education and to various social changes stimulating the intellectual vigour of women; and also in part to improvements in the patent laws.

The sub-section on Art includes a few carefully selected pictures by leading women artists; among others by Lady Butler, one of whose pictures, painted when she was Miss Elizabeth Thompson, led Mr. Ruskin to retract the dictum he had once laid down that no woman could ever compose and paint a picture. The work of this sub-section includes the decoration of the vestibule with wall-paint-

ings by Mrs. Swynnerton and Mrs. Lea Merritt, and reliefs by Miss Ellinor Hallé and Miss Rope. In estimating the social changes which have so greatly affected the position of women in every civilised country, it may not be without interest to recall the fact that about a hundred years ago the practice of the arts was considered, even by men of robust understanding, to be unwomanly. In Boswell's "Life of Johnson" we read: "Johnson was in such good spirits, that everything seemed to please him as we drove along. Our conversation turned on a variety of subjects. He thought portrait painting an improper employment for a woman: 'Public practice of any art,' he observed, 'and staring in men's faces, is very indelicate in a female.'"

Special attention may here be called to a small but interesting portrait gallery of notable Englishwomen, from very early times down to the present day; collected by Mrs. Helen Blackburn.

The sub-sections representing the Scottish, Irish and Welsh domestic and village industries have a special, and partly an antiquarian, interest, as specimens of the survival, in these days of steam and elaborate machinery, of those primitive employments that have been handed down from mother to daughter for uncounted generations. The origin of the word "Spinster" will be demonstrated in this sub-section to young people visiting the Exhibition.

The sub-section Literature includes a select library of 600 volumes from among those which Englishwomen have added to the literature of their country, and also some rare first editions and some very interesting manuscripts of books and music.

Writing in 1810, Sydney Smith remarked that at that time owing to the very low standard of ordinary education among women and the absence of any kind of encouragement to them to undertake intellectual exertion, there was hardly a single work either of reason or imagination written by a woman in English literature, and that scarcely one woman had crept even into the ranks of the minor poets. A very large proportion of the books in this sub-section will, therefore, be found to belong to the present century.

The sub-section Nursing is one in which Englishwomen take a special pride. They believe the work of their countrywomen in this

department to be first in point of excellence, as it was, under the able guidance of Miss Florence Nightingale, first in point of time. A very complete collection has been provided in this sub-section of every kind of appliance and contrivance used in nursing; and some experienced English nurses will be present to explain and illustrate the use of the various exhibits.

Of the two remaining sub-sections, Philanthropic work and Education, it is obvious that though the subjects embraced by them are among the most important kinds of women's work, they do not lend themselves very easily to representation or illustration by means of an exhibition. The results of work in both these fields are mainly moral and intellectual, and the progress made in them can be better explained by the reading of papers at the Congresses to be held in connection with the Exhibition than on the stalls and walls of the World's Fair. Both these sub-sections have, therefore, provided a tolerably complete series of papers dealing with their respective subjects. Philanthropic work will be described by papers on Rescue, Reformatory and Industrial Homes; on Women's Work as Poor Law Guardians; on societies which may be regarded as supplementary to Poor Law Organisation, such as the Metropolitan Association for Befriending Young Servants, and the Girls' Friendly Society; on Work for the Blind, Deaf and Dumb, and Cripples; on Girls' Clubs, Mission and Temperance Work, and Work among Soldiers and Sailors. Wherever it can be suitably done, these papers will be illustrated by exhibits to be found in the British Section of the Women's Building. These will include specimens of work done in industrial institutions; pictures and photographs of buildings; portraits of founders and leaders; books containing reports of institutions; biographies of eminent workers, and so forth.

In the Education sub-section a similar plan has been pursued. Papers will be provided descriptive of the educational activity of Englishwomen at home, in the colonies, and abroad; and these papers will be illustrated by exhibits to be found in the Women's Building. Among these are a complete series showing the whole work in all the classes of two typical girls' schools belonging to the Girls' Public Day School Company. There are also, as illustrative of University Education, photographs of buildings, of students'

rooms, of groups of students and of the staffs of the colleges, besides the reports and calendars. As this sub-section includes the Medical Education of Women, one paper will be read on that subject; and pictures will be found of the New Hospital for Women, in which all the regular staff are women doctors; photographs of the wards of the Royal Free Hospital, in which the women medical students receive instruction; photographs of the various women's medical schools in London, Edinburgh, and Glasgow.

In conclusion, the Committee feel, while sensible of the inadequacy of their exhibit as an illustration of the various activities of their countrywomen, it at least suffices to show that, from the Lady on the Throne to the stocking knitter in the Highlands, the women of the United Kingdom do not deserve the reproach which attends on those who eat the bread of idleness.

DEPARTMENT M.

ETHNOLOGY, ARCHÆOLOGY, PROGRESS OF LABOUR
AND INVENTION.

GROUP CLX.

FURNITURE AND CLOTHING OF ABORIGINAL, UNCIVILIZED AND BUT
PARTLY CIVILIZED RACES.

Cook, Thomas, & Son. *See* GROUP LXXXV.

Institute of British Carriage Manufacturers. *See* GROUP
LXXXIII.

GROUP CLXI.

IMPLEMENTS OF WAR AND THE CHASE.

See also GROUPS LXXXVI. and CXIII.

GROUP CLXII.

TOOLS AND IMPLEMENTS OF INDUSTRIAL OPERATIONS.

See other groups to which objects respectively belong.

GROUP CLXIII.

ATHLETIC EXERCISES—GAMES.

See games, GROUP CXLVII.

GROUP CLXVI.

MODELS AND REPRESENTATIONS OF ANCIENT VESSELS, PARTICULARLY
OF THE PERIOD OF THE DISCOVERY OF AMERICA.

Peninsular and Oriental Steam Navigation Co., Limited. *See*
GROUP LXXXV.

GROUP CLXVII.

REPRODUCTIONS OF ANCIENT MAPS, CHARTS, AND APPARATUS OF
NAVIGATION.

See also maps and charts, GROUP CL.

GROUP CLXVIII.

MODELS AND REPRESENTATIONS OF ANCIENT BUILDINGS, CITIES, OR
MONUMENTS OF THE HISTORIC PERIOD ANTERIOR TO THE DISCOVERY OF
AMERICA.

584 Maudslay, Alfred P., 11 *Park Lane, London, W.* [Ethn. B.]
Photographs of ancient Indian monuments and buildings in
Central America (Guatamala, Honduras, Chiassas, and Yucatan).

GROUP CLXX.

ORIGINALS, COPIES, OR MODELS OR GRAPHIC REPRESENTATIONS OF
NOTABLE INVENTIONS.

British Government. *See GROUP CXXXIII.*

London & North Western Railway Company. *See GROUP
LXXX.*

GROUP CLXXI.

OBJECTS ILLUSTRATING GENERALLY THE PROGRESS OF THE AMELIORATION
OF THE CONDITIONS OF LIFE AND LABOUR.

See labour-saving machines, Department F and GROUP LXXXIX.

GROUP CLXXIII.

STATE, NATIONAL AND FOREIGN GOVERNMENT EXHIBITS.

British Government—

BOARD OF AGRICULTURE. *See GROUP XV.*

GEOLOGICAL SURVEY OF THE UNITED KINGDOM. *See GROUP CLII.*

ORDNANCE SURVEY OF GREAT BRITAIN AND IRELAND. *See
GROUP CLII.*

POSTAL TELEGRAPH DEPARTMENT. *See GROUP CXXXIII.*

SCIENCE AND ART DEPARTMENT. *See GROUP CXLIX.*

Indian Government—

REVENUE AND AGRICULTURAL DEPARTMENT. *See GROUP XIX.*

GROUP CLXXII.

WOMEN'S WORK.

EDUCATION.

President: Mrs. FAWCETT.

Miss BUSS.	Miss TODD.
Miss JULIA COCK, M.D.	Miss KINGSLEY.
Miss DAVENPORT HILL.	Miss F. STEVENSON.
Miss GURNEY.	Miss L. STEVENSON.

The last quarter of a century has witnessed a complete change in the aims and methods of education for women and girls in the United Kingdom. University education has been placed within the reach of women all over England, Scotland and Ireland, and large numbers of women have availed themselves of it, and have shown not only by their academical honours, but by their subsequent work in a great variety of directions, that the labour of cultivation has not been applied to an ungrateful soil.

During the same period a corresponding change and improvement has taken place in the educational work done in girls' schools. It is probably no exaggeration to say that there is not a girls' school in the United Kingdom that has not benefited by it. The exhibits sent by the Girls' Public Day School Company afford an illustration of the lines upon which the education of girls is now conducted.

It has been the duty of the Sub-committee on Education to collect a series of exhibits illustrative, as far as may be, of the recent development of activity in all branches of education for women and girls. From one point of view, the difficulty of doing this is so obvious as to need no emphasizing. The results of education are moral and intellectual, and are, in so far, incapable of material manifestation in methods suitable for purposes of exhibition. The Sub-committee, however, hope that while their exhibit is fairly illustrative of the material side of the change which has taken place, it will serve to remind the spectator that the material change presents only one side—and that the least important side—of the whole question. Pictures and photographs of buildings; students' rooms; groups of students; of the wards of hospitals officered by women doctors; of the various medical schools for women; models of women's inventions bearing on education; calendars and reports of universities, colleges and

schools, will tell their tale of minds enlarged, invigorated, and purified by access to the means of knowledge, and by increased opportunities of entering upon new fields of activity and usefulness.

One part of the exhibit calls perhaps for special remark and explanation. The long row of beautiful children whose mothers have had a university education has the motto appended to it: "*Non angli sed angeli.*" This is intended to reassure the timid, and to remind them that for 1,300 years the beauty of English children has passed into a proverb; so far, it has not been injured by educating their mothers. Experience, as far as it has gone, justifies the belief that education is not one of the things that "harm distinctive womanhood."

The Sub-committee have made arrangements for supplementing their exhibit by the contribution of papers to the Educational Congresses. These papers will deal with the education of women in all parts of the United Kingdom and in the more important of the British Colonies and Dependencies; one paper will be devoted to the subject of the Medical Education of Women in the United Kingdom.

M. G. F.

ENGLAND.

COLLEGES.

Girton College, Cambridge.—Architect's drawing of the college buildings; students' rooms; views of the college; Anglo-Saxon pottery (found in the garden at Girton).

Newnham College, Cambridge.—Buildings of the college; students' rooms; group of students, and staff of the college, 1891.

Somerville Hall, Oxford.—College buildings and grounds; students' rooms; group of students.

Lady Margaret Hall, Oxford.—Group of students.

Royal Holloway College, Egham, Surrey.—Views of the buildings; picture gallery; chapel.

University College, Nottingham.

Westfield College, London.

Bedford College, London.—Students acting in "*Iphigenia in Tauris*"; views of interior.

MEDICAL EDUCATION.

New Hospital for Women.—Four water-colour drawings of interior ; architect's drawing of exterior ; photographs of medical staff.

Royal Free Hospital (where women medical students receive clinical instruction).—Photographs of wards and museum.

London School of Medicine for Women.—Groups of students.

Clapham Maternity Hospital.—Photograph of ward.

SCHOOLS.

**North London Collegiate School for Girls.*—Views of the school buildings ; group of students in Greek play ; portrait of the founder and principal, Miss Frances M. Buss ; architect's drawings of school buildings ; college magazines, reports.

Princess Helena College, Ealing, London.—Exterior of building ; students in the cricket field ; the studio ; the "Helena" dormitory ; the hall and library.

Ladies' College, Cheltenham.—Photographs ; college magazines containing the history of the college.

GIRLS' PUBLIC DAY SCHOOL COMPANY, LIMITED.

Sheffield High School.—Architectural drawings of school ; monitress list ; sketches of Swedish drill ; drawings ; general time table ; Kindergarten work ; specimens of work done in the school ; photographs, school magazines, programmes of prize distributions.

Blackheath High School.—Photographs ; specimens of work ; time tables and schemes of work.

York High School.—Photographs of pupils acting in "As You Like It ;" Drawings selected by Mr. Ablett, Inspector of drawing in Schools of the Girls' Public Day School Company, in accordance with the scheme of Drawing Society ; school magazines.

Harrow Music School.—Examination papers and publications.

* One of the earliest public schools for girls in England. The High Schools were subsequently formed on similar lines.

INVENTIONS BEARING ON EDUCATION.

Line-divider (Mrs. Ayrton's).

Geodoscope (Miss A. Gregory's).

Puzzle Alphabet (Mrs. Mitford's).

Skeleton Celestial Globe (Miss Kerr's).

"Theoria Harmonica" (Miss Huddleston's).

"Facile," invention for teaching notation (Miss Linscott's).

Philograph (Miss A. Osborne Moore's).

Kindergarten Loom (Miss Constance Barnard's).

Script Letters (Miss Constance Barnard's).

Paragon Needlework Apparatus (Miss Lambert's).

Geographical Cards (Mrs. Jessie Farwell's).

Arithmetron (Miss Croad).

PORTRAITS.

Tripes Students, Newnham College, Cambridge.

Graduates of London University : pupils of North London Collegiate School.

The First Woman M.A. of London University and her sister, also M.A. of London.

The First Nine Women Graduates of the Royal University, Ireland.

Classical Lecturer, Classical Tripes, Cambridge, Girton College.

A London B.A.

Head Mistress, Blackheath High School.

A London Graduate and Newnham Tripes Students.

London B.A.s, Sheffield High School.

Graduates of London University.

North London Collegiate School for Girls.

Children whose mothers have had a university education.

University students and a moral science baby.

Graduates of London University (Ladies' College, Cheltenham).

I R E L A N D.

I.—OFFICIAL EDUCATIONAL SYSTEMS

for both sexes.

Report and rules, Board of National Education; Report of the Board of Intermediate Education, and Memorials addressed to the Board and Chief Secretary; Report of the Royal University of Ireland.

II.—COLLEGES,

founded by men, to which women have been from time to time admitted.

Queen's College, Belfast.

Royal College of Surgeons, Dublin, and Royal College of Physicians.

Royal College of Science, Dublin.

Magee College, Londonderry.

Methodist College; and the McArthur Hall (for women), Belfast.

III.—COLLEGES,

founded by women, for women.

Alexandra College, Dublin.—Portrait of the late Mrs. Jellicoe, the founder; view of the College; set of College Calendars; historical sketch, by Miss White.

Victoria College, Belfast.—Portrait of Mrs. Byers, founder and principal; photograph of the College; group of students and teachers; copy of the College certificate; set of the Victoria College Magazine; prospectus, and list of Royal University Honours, 1892; summary of Honours, University, Intermediate, and Special.

I.—SCHOOLS.

Schools founded and carried on by women, giving advanced education:—

Ladies' Collegiate School, Londonderry.

Strand House School, Londonderry.

Alexandra School, Carrickfergus.—Photographic group of pupils and teachers; Reports for 1890 and 1892.

Alexandra School, Dublin, in connection with *Alexandra College.*—Sketch of the history of the school by Miss Mulvaney.

Following written School Reports:—

High School for Girls, Cork.

Wellington Park, Belfast.—Misses Reid.

Seatown Place, Dundalk.—Misses Parks.

Portadown.—Miss Kintread.

Rutland Place, Dublin.—Miss McCutcheon.

The Moravian Schools, Gracehill, co. Antrim.

Cookstown.—Miss Houston.

Coleraine.—Misses Irwin.

Dungannon.—Miss McDermott.

Russell Street, Armagh.—Miss Bell.

Princess Gardens, Belfast.—Misses Hunter.

Driel College, University Square.

Osborne Park.—Misses Bryce.

The Sullivan Schools, Holywood, co. Down.

Intermediate School, Newry.

Warrenpoint.—Madame Ternan.

II.—SPECIAL SCHOOLS.

Rochelle Schools, Cork, for daughters of army officers and professional men.—Photograph of school; of gymnasium class; historical sketch by Rev. Canon Macnamara.

Schools belonging to the Society of Friends:—

Girls' Advanced School, Mountmellick.

Agricultural School (boys and girls), Brookfield, Mona.

Brookfield School.

Lisburn School.

Clergy Daughters' School, Dublin.

Female Masonic School, Dublin.

Training College, Kildare Place, Dublin, in connection with the Protestant Episcopal Church.

III.—MISCELLANEOUS.

Report of the Irish Schoolmistresses' Association for 1890, containing an important Memorial to the Intermediate Board of Education.

Memorial to the Council of Trinity College, Dublin, asking for the admission of women.

Comparative summary of the results of the Intermediate Examinations of 1892, both boys and girls.

SCOTLAND.

EDINBURGH.—SCHOOL BOARD.

Photographs of Schools; Time Tables :—

Edinburgh Royal High School (founded early in 12th century, date of present building 1829).

Sciennes Public School.

London Street Public School.

Torphelian Street Public School.

EDINBURGH MEDICAL EDUCATION.

Edinburgh School of Medicine for Women.—Photographs of buildings; groups of students; reports, &c.

Scottish Association for the Medical Education of Women.—Photographs and reports.

GLASGOW SCHOOL BOARD.

Complete plans of school; photographs; prospectuses; reports; maps; drawings illustrative of standard work.

GLASGOW MEDICAL EDUCATION.

Queen Margaret's College.—Photographs and calendar.

FINE ARTS.

PICTURES SENT BY HER MAJESTY AND THE ROYAL FAMILY.

I. Six original sketches from nature, contained in one frame, by H.M. the Queen :—

1. View from the Queen's room at Balmoral, in snow, November 12, 1880.

2. View from another window, also at Balmoral, November 18, 1878.

3. Pug belonging to Prince Henry of Battenberg, drawn by the Queen in the railway, June 24, 1886.
4. "Spot," the Queen's fox-terrier, January 25, 1891.
5. View at Aix-les-Bains from Tresserve.
6. View from the Queen's sitting-room at Balmoral in autumn, 1878.

II. Copy in water-colours from an oil painting size of life of H.M. the Queen's Munshi and Indian secretary, Ab-dul Karim, 1892, by H.M. the Queen.

III. Two pictures in oil, by H.R.H. Princess Christian of Schleswig-Holstein.

IV. Study from nature in water-colours, by H.R.H. Princess Louise (Marchioness of Lorne).

V. A picture, by H.R.H. Princess Beatrice (Princess Henry of Battenberg).

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|--|---|---|---|--|
| 1. Old Sussex Cottage | . | . | . | <i>Mrs. Allingham.</i> |
| 2. "To the front" (French cavalry leaving a Breton town on declaration of war) | . | . | . | <i>Lady Butler.</i> |
| 3. Hastings | . | . | . | <i>Madame Bodichon</i>
(The Founder of Girton). |
| 4. Portrait of a Baby | . | . | . | <i>Miss Alice Grant.</i> |
| 5. An English Maiden | . | . | . | <i>Mrs. Jopling-Rowe.</i> |
| 6. Pallazzio Rezzonice, Regatta Day (Browning's palace, Venice) | . | . | . | <i>Miss Clara Montalba.</i> |
| 7. A Market Woman, Dortrecht | . | . | . | <i>Miss Hilda Montalba.</i> |
| 8. On the Riviera | . | . | . | <i>Miss Ellen Montalba.</i> |
| 9. Dolly's Ball-dress | . | . | . | <i>Mrs. Perugini.</i> |
| 10. Eurydice sinking into Hades | . | . | . | <i>Miss Henrietta Rae.</i> |
| 11. The End of the Hop-harvest, Kent. | . | . | . | <i>Miss Steward Wood.</i> |

HANDICRAFTS.

President : Lady ROBERTS.

Mrs. JACK JOHNSON.
Miss HELEN BLACKBURN.

Miss WEBSTER.
Miss C. HOLDEN, *Hon. Sec.*

H.M. the Queen.

Two napkins made from flax spun by Her Majesty.

A hat plaited by Her Majesty and given to her granddaughter,
Princess Victoria of Schleswig-Holstein.

H.R.H. The Princess of Wales.

Corner chair of carved oak and cut and embossed cowhide.

H.R.H. Princess Helena (Princess Christian of Schleswig-Holstein).

Embroidery on linen; knitted jersey.

H.R.H. Princess Victoria of Wales.

Music stool of carved oak and cut and embossed cowhide.

H.R.H. Princess Maude of Wales.

Stool of carved oak and cut and embossed cowhide.

BOOKBINDING AND COVERING.

Bayly, Miss Helen.

10 vols. Shakespeare, bound in cut leather.

Birkenwith, Miss, 58 Bedford Gardens, Campden Hill, London, W.

Books bound and tooled.

Brownlow, Mrs. Harry, 4, Carlyle Terrace, Chesterton Road, Cambridge.

Embroidered bookcovers.

Firth, Miss Susanna.

Books bound in cut and tooled leather.

Nichols, Miss.

Bindings in various leathers.

Noedel, Miss Charlotte, *Superintendent of H.R.H. the Princes of Wales' Technical School, Sandringham.*

Blotter of oak, with panel of cut embossed enamelled cowhide over silver.

Prideaux, Miss S. T., *37 Norfolk Square, London, W.*

Bindings in various kinds of leather and in embroidered velvet.

Royal School of Art Needlework, *Exhibition Road, South Kensington, London.*

Books bound in vellum, illuminated.

ILLUSTRATIONS FOR BOOKS.

Bradley, Miss Gertrude A., *95 Colmore Row, Birmingham.*

Series of illustrations for fairy tales.

Canton, Miss S. R., *Past Student Female School of Art, Queen Square, Bloomsbury.*

Black and white illustrations; magazine cover.

Dicksee, Miss Margaret, *Past Student Female School of Art, Queen Square, Bloomsbury.*

Black and white illustrations.

Greenaway, Miss Kate, *50 Frognal, Hampstead, London, N.W.*

Four drawings for illustration to book of "Children's Games."

Pocock, Miss Julia, *5 Clifton Hill Studios, St. John's Wood, London, N.W.*

"Enoch Arden," illustrated.

Whipple, Miss Amy, *Fairhaven, St. Budeaux, Devonport.*

Set of designs in water-colour illustrating Hood's poem, "Flowers."

Wyatt, Miss K. M., *Past Student Female School of Art, Queen Square, Bloomsbury.*
Magazine cover.

CAMEOS.

Astbury, Mrs. W. Spencer, *Heathgate, Tunbridge Wells.*
Head of Savonarola, female head, portrait of Cardinal Newman.

Pocock, Miss Julia, 5, *Clifton Hill Studios, St. John's Wood, London.*
Cameo shell, Queen's Jubilee coinage.

CARVING.

In Wood.

Barr, Miss Lizzie, *Apsley Cottage, East Grinstead, Sussex.*
Oak Court cupboard or sideboard, style of reign of James I.

Dobbings, Miss Lucie A., 7 *Wells Close Terrace, Leeds.*
Octagonal walnut table of Swedish Sloyd carving.

Eliot, Mrs. C. T., *Foleshill Vicarage, Coventry.*
Old English eight-day clock, solid oak.

Elont, Miss, *Chillingham Castle, Belford, Northumberland.*
Walnut dressoir, after the old Flemish, 17th century.

Heath, Miss Maud A., *Leigh, Tonbridge, Kent.*
Long walnut wood frame with shelf for photos; carved mahogany frame with painting after Burne-Jones.

Packer, Miss Elizabeth, *care of G. Stanley Brown, Cypress House, Dulwich, London.*
Copies in oak of sacred columns formerly placed on either side of Viking's chair.

Reeks, Miss Maria E., *School of Art Wood Carving Technical Institute, Exhibition Road, London.*

Oak mirror frame after the Italian, 16th century.

Royal Normal College and Academy for the Blind, *Upper Norwood, London.*

Models in woodwork made by the Anglo-American Sloyd carvers.

Tankerville, Countess of, *Chillingham Castle, Belford, Northumberland.*

Walnut buffet, after the Flemish, 16th Century; also walnut dressoir after the Flemish, 17th Century, in conjunction with Miss Elont.

Wilkinson, Miss Gladys.

Frame carved and gilt; painting by Miss Barbara Hamley.

Williams, Miss Constance, *School of Art Wood Carving Technical Institute, Exhibition Road, London, S.W.*

Oak mirror after the Flemish, 16th Century.

In Ivory.

Tankerville, Countess of, *Chillingham Castle, Belford, Northumberland.*

Fan handle, plaques for note-book or card-case.

In Stone.

Bonham, Miss Agnes, *Stretton Lodge, South Norwood Hill, Surrey.*

Photographs of reredos in St. John's Church, Norwood, carved by herself.

CHROMO-LITHOGRAPHY.

Chromo-Lithographic Studio (The), *24a Gloucester Street, Queen Square, Bloomsbury, London.*

Birds, heads, and figure subjects.

DESIGNS.

Aumonier, Miss Louise, *Ballinger, near Great Missenden, Berks.*

For wall papers.

Betts, Miss Lily M., *5 Highbury Hill, London.*

For wall paper, for frieze or embroidery.

Bradley, Miss Gertrude, *Studio, 95 Colmore Row, Birmingham.*

Coloured, of "Fox and Geese."

France, Miss Georgia Cave, *Tysley, near Birmingham.*

For wall paper, showing repeats.

Gemmell, Miss Mary, *45 Gloucester Street, Warwick Square, London.*

For wall papers.

Murray, Miss E. Emily, *8 Tedworth Square, London, S.W.*

For china tea service.

Murray, Miss Nina, *24, Huntress Row, Scarborough, Yorks.*

Parker, Miss Violet M., *Parkfield, Lyttleton Road, Edgbaston, Birmingham.*

For wall paper.

Prochantza, Baroness Pauline, *Tyrath, Kilkenny, Ireland.*

For frieze.

ETCHINGS AND FASHION PLATES.

Martyn, Miss E. K., R.P.E., *27, Ainger Road, London, N.W.*

Illustrations to "Christabel."

Parker, Miss Violet M., *Parkfield, Lyttleton Road, Edgbaston, Birmingham.*

Finger plates mounted.

Piper, Miss Elizabeth, *3 Oakley Flats, Chelsea, London.*

"The Chelsea homes of Carlyle, Rossetti, Turner, and George Eliot"; "Westminster Abbey"; "The Spinning Wheel."

Young, Miss Lilian, 57, *Haverstock Hill, London, N.W.*
Fashion drawings in wash and line.

Young, Miss Maggie, 57, *Haverstock Hill, London, N.W.*
Fashion drawings in wash.

FAN PAINTING.

Arding, Miss Helen, *Artists' Guild, 1a Berkeley Gardens, Camden Hill, London, W.*
Gauze fan leaves.

Canton, Miss S. R., *Past Student Female School of Art, Queen Square, Bloomsbury.*

Granville, Miss, *Grand Pré, Biarritz, France.*
Gauze fan leaves.

Horton, Miss G. E., *Past Student Female School of Art, Queen Square, Bloomsbury.*

Jay, Miss Isabella, 12 *Redcliffe Road, London, S.W.*
Fans copied from Turner's "Caligula Castle and Bridge," and "Approach to Venice."

Iangford, Miss Alice, *Female School of Art, Queen Square, Bloomsbury.*
Watteau fan.

Manly, Miss Alice.

Fan designed and painted by command of the Queen and presented by her to H.R.H. Princess Beatrice on her marriage.

O'Connor, Miss Evelyn, 21 *Clarence Parade, Southsea, Hampshire.*
Gauze fan.

Reid, Miss A. M., 1 *Augustine Road, West Kensington, London, W.*
Fan in Pompeian style.

Vasey, Miss Clara, 99 *Elm Park, Brixton Hill, London, S.W.*
Gauze leaf, painted Cupids; fan, "All Nations visiting the World's Fair."

FLY TYING.

Brocas, Mrs. Letitia, 5 *Rochester Row, Victoria Street, London, S.W.*

Case of artificial flies for trout and salmon fishing.

GESSO DURO.

Barker, Miss May, *Devonshire Mansions, 107 Marylebone Road, London, W.*

Decoration for piano front.

Barker, Miss May.

Panels for pilasters (design by Miss E. M. Rope).

Wylie, Mrs. C., 3 *Earl's Terrace, Kensington, London, S.W.*

"Twilight," in frame by Florence Major; "The God of Love."

GLASS, STAINED AND ENAMELLED.

Casella, Miss Ella, 1 *Wetherby Road, Kensington, S.W.*

Enamelled decanter and glasses.

Casella, Miss Nelia, 1 *Wetherby Road, Kensington, S.W.*

Enamelled glass jar.

Newill, Miss Mary, 7, *Priory Road, Edgbaston, Birmingham.*

Cartoons for stained glass windows.

GOLDSMITH'S WORK.

Brock-Hollinshead, Miss, *Bridgwater House, Seaton, Devonshire.*

Tiaras, necklaces, hairpins, and pins of filigree.

Newman, Mrs., 18 *Clifford Street, London, W.*

Necklaces, brooches, bracelets of gold, with enamel and precious stones.

GRAPHIC CHART OF WOMEN'S PROGRESS IN THE BRITISH ISLES, FROM
1857 TO 1892.

Sent by the Central Committee, National Society for Women's Suffrage,
10 *Great College Street, Westminster, London, S.W.*

ILLUMINATIONS.

Channer, Miss C. A., 32 *Pembroke Square, London, W.*

Triptych of MS., illuminated.

Lynch, Miss Agnes, 12 *Abingdon Mansions, Kensington, London, W.*

Illuminations on vellum.

HANDSPUN LINEN.

Langdale Linen Industry (Miss Smith), *St. Martin's, Langdale, Ambleside.*

Specimens of handspun and handwoven linen.

LEATHER WORK.

Aluta, 192 *Piccadilly, London, W.*

Embossed leather card and letter cases with nickel corners.

Bartlett, Miss, *Highfield, Knotty Ash, Liverpool.*

Blotting book and folding writing case in embossed leather.

Bassett, Miss M. A., *The Heath, Leighton Buzzard.*

Specimens of leather work, blotting book cases, &c.

Bayly, Miss Helen, 113 *Via San Gallo, Florence, Italy.*

Blotter, leather wallet, and card cases.

Bowley, Mrs. Richard, 9 *Napier Road, Kensington, London, W.*

Blotter and ladies' card-case in embossed, cut, and incised leather work.

Christie, Miss M., 11 *Edith Road, West Kensington, London, W.*

Embossed leather blotting book.

Firth, Miss Susannah, *Kirby Lonsdale, Westmoreland.*

Blotting book in embossed leather.

McClure, Mrs. Edmund, 80 *Eccleston Square, London, S.W.*

Ancient Cromwellian chair re-covered modern embossed and lacquered leather.

Ottman, Miss, *Fetteresso Castle, Stonehaven, N.B.*

Game book with coat of arms.

Smith, Miss Sophia, *Kirby Lonsdale, Westmoreland.*

Screen panel.

Wetton, Miss Edith, *21 Lower Phillimore Place, Kensington, London, W.*

Chair covered, worked by Eveline Jones.

‘Wheatley,’ Dorothy Helena, *18 Thurloe Place, South Kensington, London.*

Armchair for hall, embossed with coat of arms on leather and mounted.

MEDIUMS FOR ARTISTS.

Turck, Miss E., *7 St. George’s Square, Primrose Hill, London, N.W.*

Specimens of work done with Florentine tapestry medium, rilievo plaque, ecailline enamel, croissant body colours and aquarella medium, marqueterie woodstains, samples of artistic medium colours and other preparations. Cheval screen with panels after an old tapestry in St. John’s House, Warwick.

MARQUETERIE.

Malet, Miss Mabel W., *23 Trafalgar Square, Chelsea, London, S.W.*

Writing set, paper knife, table, glove and handkerchief boxes, photograph frames.

Working Ladies’ Guild, *251 Brompton Road, S.W.*

Photograph frames, table with glass top, writing-desk and screen, clock-case, &c.

MODELLING.

Bradley, Miss Gertrude M., *Studio, 95 Colmore Row, Birmingham.*

Panel illustrating “The Shoemaker and the Elves” (Grimm).

Brown, Miss Kate L., *Manor House, Spring Hill, Birmingham.*

Designs for panels.

Canton, Miss S. R.

Wax figure, "Fairy Godmother."

Casella, Miss Ella and Miss Nelia, 1 Wetherby Road, London, S.W.

Coloured wax bas-reliefs.

France, Miss Georgia Cave, Tysley, near Birmingham.

Panel of fish and seaweed, models for repoussé silver dish and bottle, for repoussé silver eau de cologne bottle, water bottle, and fan-stick.

Giles, Miss Margaret, 60-NeVERN Square, London, S.W.

Medallion plaster, design for plaster frieze "Floreat Flora."

Quesne, Miss, Female School of Arts, Queen Square, Bloomsbury,
Dancing figures.

MOSAICS.

Hodge, Miss Alma, 131 Portsdown Road, Maida Vale, London, W.

MINIATURES.

Grosvenor, Hon. Mrs. Norman, 30 Upper Grosvenor Street, London, S.W.

Case of miniatures.

Hamley, Miss Barbara M., 52 Eaton Terrace, London, S.W.

Case of miniatures.

Harbutt, Mrs. Cambridge, Paragon Art Studio, Bath.

Case of miniatures.

PAINTING.

On China.

Beane, Miss Elizabeth, 2 Portland Place, Peckham Road, Camberwell.

Plaque, Royal arms of England.

Butterton, Miss Mary, 68 *South Lambeth Road, S.W.*
Plaque (flowers).

Goodwin, Miss Ada E., 14 *Vernon Street, Derby.*
Plaque of Roman design.

Harbutt, Mrs. Cambridge, *Paragon Art Studio, Bath.*
Paintings on china.

Harrison, Miss Emily.
A Florentine poem.

Lewis, Miss Florence, 19 *The Terrace, Camberwell, London, S.E.*
Dessert service (Scotch scenes and flowers).

Sansom, Miss Nellie, 23 *Brockley Road, West Kensington, London, W.*
“Le Reveil”; a portrait; “Margaret.”

Thatcher, Miss Euphemia, 28 *Priory Road, Wandsworth Road, London, S.W.*
Panel (flowers).

Williamson, Mrs., 26 *Russell Road, Kensington, London, W.*
Plaque (“Tears”).

On Panels and Screens.

Elont, Miss, *Chillingham Castle, Belford, Northumberland.*
Screen, old Watteau pattern, mounted style Louis XV.

Prior, Mrs. Mabel, 12 *Douro Place, Victoria Road, Kensington, W.*

Spiers, Miss Charlotte, 21 *Bernard Street, London, W.C.*
Panel painted tulips.

Tankerville, Countess of, *Chillingham Castle, Belford, Northumberland.*
Screen, old Watteau pattern, mounted Louis XV.

Woolhouse, Miss Margaret, *12 North Side, Clapham Common, London, S.W.*

Screen with painted panels.

PATENTED INVENTIONS.

Barron, Miss M. A., *Swanmore, East Moulsey, Surrey.*

Collapsible noiseless coal scuttle; combined dress stand and fire-escape.

Brown, Miss Mary, *98 Paradise Road, Clapham, London, S.W.*

Patent household portable washing copper.

Calverley Bewicke, Mrs., *Queen Anne's Mansions, St. James' Park, London, W.*

Music folio and stand.

Claxton, Mrs. M. A., *Dovedale, Percy Street, New Brighton, Cheshire.*

Combined table and book rack.

Dale, Mrs. M. A., *22 Sheen Park, Richmond, Surrey.*

Folding mail-cart.

Garwood, Mrs.

Invention for facilitating the pouring out of bottles.

Gladstone, Mrs. M. C., *Great Barton Vicarage, Bury St. Edmunds.*

Combined travelling trunk and wardrobe.

Grimes, Mrs. E., *Knapston Hall, North Walsham, Norfolk.*

Protectors for fingers when sewing.

Hungerford, Miss M. S., *The Island, Clonekilty, co. Cork, Ireland.*

Boots and gaiters, shewing new method of lacing same.

Impsey-Lovibond, Miss M. A., *New Hall, Ardleigh, Essex.*

Combined sealing-wax holder and seal.

Jones, Mrs. S. E., *Llanfair-is-gaer Vicarage, Port Pinorwie, Bangor, Wales.*

Hygienic egg boiler.

Kesteven, Mrs., 1 *Lansdowne Terrace, Hampton Wick, Middlesex.*
Improved carving fork.

Mackie, Mrs., 27 *Chancery Lane, London, W.C.*
Clothes washer.

Malcolmson, Mrs. C. A., *Norrysbury, East Barnet, Herts.*
Expansible umbrella holder.

McCleverty, Mrs., *Kingsland, Newnham-on-Severn, Gloucestershire.*
Combination skirt stand and table.

Parnell, Mrs. Barnston, *Elgin Road, Wallington, Surrey.*
Drawings of inventions for extracting gold from base metal.

Peckover, Miss, 66 *Great Russell Street, Bloomsbury, London, W.C.*
Sanitary sink basket.

Phillipps, Mrs. M. D., 12 *Burchington Road, Kilburn, London, N.W.*
Ear trumpet.

Seaton, Miss R., *Halliford House, Sunbury-on-Thames, Middlesex.*
Cleats for holding ends of threads.

Stephenson, Miss R., 23 *Norfolk Street, Park Lane, London, W.*
Knee music stand.

Symonds, Mrs. S., 7 *Smith Street, Guernsey, I.M.*
Adjustable millinery stand.

Tenison, Mrs. F., 215 *Uxbridge Road, London, W.*
Appliance for lifting hot plates.

Turck, Miss D. E., 7 *St. George's Square, Primrose Hill, London.*
Specimen of painting on textiles.

PLAN TRACING.

Long, Miss E. T., *Ladies' Tracing Office, 8 Great Queen Street, London, S.W.*
Specimens of plan tracing.

PHOTOGRAPHY.

Browne, Miss Frances, 135 *Regent Street, London, W.*

Portraits in photographic, sepia, and Bartolozzi tint, and black and white.

Shand, Miss Alice M., *Parkholme, Elm Park Gardens, London, S.W.*

"Rest."

PRINTING.

Women's Printing Society, Limited, 21b *Great College Street, Westminster, London, S.W.*

Specimens of type setting.

PYROGRAPHY OR POKER WORK.

Hope-Shorrock, Mrs. Samuel, 16, *Bank Street, Darwen, Lancashire.*

Three panels ; photo frame, original design.

Working Ladies' Guild, 251, *Brompton Road, London, S.W.*

Bureau, grotesque designs ; chest, as supplied to her Majesty the Queen ; folding heart-shaped table.

REPOUSSÉ WORK.

Bewicke, Calverley, Mrs., *Queen Anne's Mansions, St. James's Park, London, S.W.*

Worked silver book cover, screen in pierced brass and copper with poker worked back.

Bray, Miss Laura, *The Workshop, Shere, Guildford.*

Plaque, "Lords and Ladies."

Brown, Miss Charlotte, 4 *Hungerford Park, Tunbridge Wells.*

Pair of bellows, brush and tray.

Evans, Miss Ada M., *Witley, Surrey.*

Brass tray, alms dish.

Mills, Miss Clara, 223 *Lady Wood Road, Birmingham.*

Pair of bellows.

Rowley, Hon. Mrs., 26 *Chester Street, London, S.W.*

Silver sconces.

Walker, Miss Lilian, *Robin Hood, Birmingham.*

Bookcover (copper), salver (brass chased).

SCULPTURE IN MARBLE, TERRA COTTA, ETC.

Bonham, Miss Agnes, *Stretton Lodge, South Norwood Hill, Surrey.*

Photograph of reredos, carved by herself, in St. John's Church, Norwood.

Ferguson, Miss, *Holly Lodge, Seymour Place, Fulham Road, London, S.W.*

Marble bust, "Dorothea," from G. Eliot's 'Middlemarch'; panel in stone, column in marble.

Moore, Miss Esther M., 4 *Bath Road, Bedford Park, London, W.*

Bust in terra-cotta.

STRAW-PLAITING AND BASKET WORK.

Mansfield Girls' Institute, *Gospel Oak, London, N.W.*

Baskets.

Wood, Miss G., *Toms Hill, Aldbury, Tring, Herts.*

Baskets.

TILES.

Babb, Miss E. Charlotte, *Ivy House, 87 High Street, Clapham, London, S.W.*

Enamel tile painting; angel.

Lewis, Miss E., 10 *North Road, Clapham Park, London, S.W.*
Underglaze tile, framed.

TECHNICAL EDUCATION.

Technical College for Women, *Colquhitt Street, Liverpool.*

Photographs of classes, certificates, cooking recipes, books, plans, manual and system of technical education in cookery, household sewing and home dress-cutting, and laundry work.

UPHOLSTERY.

Garrett, Miss Rhoda M., 2 *Gower Street, London, W.C.*

Hand-made carpet.

Malet, Miss Ethel, 23 *Trafalgar Square, Chelsea, S.W.*

Coffer-shaped box.

Royal School of Art Needlework, *Exhibition Road, London, S.W.*

Footstools; foot muff; old Cromwellian chair; box; casket, etc.; screen, Louis XVI.

VERNIS-MARTIN.

Watson, Mrs. Douglas, *Rossetti Mansions, London, S.W.*

Glove-box and handkerchief-box. Subjects after Boucher.

WOOD-ENGRAVING.

Wood-block engraved (for cover of catalogue to Exhibition of Women's Industries, Bristol, 1855) by Miss Corbet Harden (design by the late Miss M. D. Tothill); sent by Miss Helen Blackburn, 10 *Great College Street, Westminster.*

Engravings by women trained at the City and Guilds of London Technical Art School; sent by Society for Promoting the Employment of Women, 22 *Berners Street, London, W.*

LACE.

President: DUCHESS OF ABERCORN.

Lady CLINTON.
 Lady ERNESTINE EDGECUMBE.
 Lady SUSAN FORTESCUE.
 Lady IDDESLEIGH.
 Lady KENMARE.
 Lady KENNAWAY.
 Lady SUSAN MORLEY.

Hon. Mrs. MARKER.
 Hon. Mrs. PEEK.
 Mrs. BRUCE CLARKE.
 Mrs. ALFRED MORRISON.
 Mrs. REEVE.
 Miss CONSTANCE HARGROVE,
Hon. Sec.

British hand-made lace, dating from Queen Elizabeth, flourishing chiefly in 17th and 18th centuries, then decaying, and now reviving, divides itself into "pillow," or "cushion," and "point," *i.e.* made with needle.

The ancient name "bone" lace is present, and the work is affected by foreign refugees—Flemish, Huguenot and others—in almost every working district.

Devonshire (1614): This is a well-worked and active centre. Chiefly "pillow," though needle-point workers still exist and are increasing. Work chiefly "Honiton" pure and simple with "trolly," and at Beer good reproducers of Italian laces.

Buckinghamshire, Bedfordshire, Northamptonshire: All "pillow" laces, "Old Bucks" being in Brussels and Mechlin style. Valenciennes, Torchon, Maltese and Spanish, this last dating from the teaching of Catherine of Arragon at Pauler's Pury.

Isle of Wight: A small industry—seemingly darned lace or "point conté."

Irish: By far the widest-spread industry, though nine centres only are working at present, as against twenty-three in years gone by. Centres: Carrickmacross and Limerick, each with a lace of their own. Ardee, Cork, Clones, Innishmacsaint and Youghal. Kinds: "Appliqué," "guipure," "tambour," "tatting," or "frivolité," of French origin; crochet of seven kinds, and Irish "point." Needleworkers still exist; but much formerly veritable point de l'aiguille is now copied in crochet.

Lace-making being an admirable home-industry, prosecuted chiefly by women, is deserving of all encouragement. It at present shows signs of increasing activity. Schools, set on foot by amateur enterprise, are supported by the traders, these two agencies being inseparable and known to be working together well and harmoniously. Mrs. Nettleship, Messrs.

Debenham and Freebody, and other fashionable houses, have given this hand-labour their patronage. The additional earnings in cottage homes prevent appeal from invalids and others for parish relief, and the longevity of workers (from seventy to ninety years being a common age), together with the enforced cleanliness and order of their dwellings, shows the sanitary and moral effects of the industry to be good.

E. B. C.

ENGLISH HAND-MADE.

Bedfordshire.

Hand-made pillow lace, and specimens of Bedford lace and fancy lace articles (lent by Messrs. C. & T. Lester, of Bedford, designers).

Buckinghamshire.

Black silk fan cover, black silk edging, narrow baby lace, white edging, white insertion, handkerchief border (white), furniture and Maltese lace, old Buckinghamshire (collected by Lady Buckinghamshire's Committee).

Devonshire.

Hand-made net, made on the pillow and with the needle. Honiton point fichu in finest thread, after an old design, and with net filling, and handkerchief, and fans with net filling (collected by Lady Iddesleigh's Committee).

Handkerchiefs and lappets in Honiton guipure, piece of trimming and flounces in Honiton point (Miss Radford, Sidmouth).

Specimens of Honiton guipure of various periods, to give idea of the alterations in style and workmanship in the last 100 years (Mrs. Fowler, Honiton).

Specimens sent by Mrs. Herbert, late Mrs. Treadwin.

Specimens of reproductions of Italian laces from Beer (Lady Trevelyan).

Isle of Wight.

Lace shawl (Harriet Eldridge, Niton).

Sundry lace articles.

Northamptonshire.

Northamptonshire real lace (as 18th century), various laces of white and brown flax, ordinary laces of various kinds (Mr. L. Stanton, Maidford, Towcester).

IRISH.

(Under the management of Mr. B. Lindsay.)

Appliqué (first taught by Mrs. Grey Porter, Rectory, Rohan). Veil worked by Mary Steadman, 1820; pattern of a flounce worked 1891.

Royal Irish Guipure (first taught by Miss Reed, Culloville, afterwards made under the direction of Mr. J. Kennedy, Carrickmacross, 1843). Fire screen showing all the various stitches of lace after the ancient Cretan model—the first fabric called lace.

Tambour (worked by a hooked and eyeless needle on tambour frames; taught under the direction of Mr. Wallis in Limerick, 1829). Patterns of the run and drawn lace.

Tatting (woven by the hand with a shuttle only; taught by Miss Ellis, Rectory, Ardee, 1845, afterwards from designs by Miss Kelly, Kelleyville, co. Kildare). Patterns.

Crochet—I. Soft (designed and invented by M. Riego Blanchardière 1845; first taught by Mr. Deane, Blackrock). Patterns of plain lace, made chiefly in co. Cork.

Crochet—II. Hard (taught by Mr. Roberts, Thornton, Kildare, and Mrs. Hand, Rectory, Clones, co. Monaghan). Patterns, imitations of antique guipure, Venetian, Spanish, Greek, Jesuit, and point d'Angleterre.

Irish Point Lace (first taught by Mrs. M. A. Smith, Presentation Convent, Youghal). Apron made in 1833, panel in 1889.

Copies of Antique Point Lace (first taught by Miss Maclean in the Rectory, Tynan, afterwards in the parochial school of Innishmacsaint, Lough Erne). Patterns.

MISCELLANEOUS.

Sundry articles sent by private workers, and also on loan.

* * Further information can be obtained at any time from the Duchess of Abercorn's Committee, Hampden House, Green Street.

LITERATURE.

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Publications by the English Royal Family.

Old and Rare Books, by the following authors:—Dame Juliana Berners, Dame Gertrude More, Lady Packington, Mary Astell, Mrs. Latter, C. R., Mrs. Pilkington, Lady Morgan, O. Moreland.

Novels, by the following authors:—Ann Radcliffe, Mrs. Edgeworth, Harriet Martineau, Mrs. Marsh, F. Burney, Mrs. Sherwood, Charlotte Smith, Hannah More, Maria Edgeworth, Miss Thackeray, Mrs. Gore, Hon. Mrs. Norton, Mrs. Inchbald, Ashford Owen, Miss Mitford, Miss Eden, Mrs. Shelley, Jane Porter, Anna H. Drury, Mrs. A. Clive, L. B. Walford, Mrs. Leith Adams, Mrs. Alexander, Charlotte M. Yonge, Amelia B. Edwards, Mrs. Oliphant, A. Brontë, C. Brontë, E. and A. Brontë, George Eliot, Jane Austen, Catherine Sinclair, Author of "Vera," Sarah Tytler, John Oliver Hobbes, Lanoe Falconer, Author of the "Atelier du Lys," Katharine S. Macquoid, Elizabeth M. Sewell, M. E. Braddon, Mrs. W. Kingdon Clifford, Mrs. Gaskell, the Author of "Kitty Trevvlyan," Jessie Fothergill, Amy Levy, Marie Corelli, Mrs. Humphry Ward, Hon. Emily Lawless, Lucas Malet, Mrs. Henry Wood, Ouida, Isabella O. Ford, L. Dougall, "A Plain Woman," Annie Keary, Florence Montgomery, M. L. Woods, D. Gerard, E. D. Gerard, Miss Muloch, E. Lynn Linton, Maxwell Gray, Ralph Iron (O. Schreiner), Mrs. Edwards, Edna Lyall, Rhoda Broughton, Mrs. J. H. Riddell, Mathilde Blind, Vernon Lee, Lady Georgiana Fullerton.

Poetry, by the following authors:—Curren, Ellis and Acton Bell; Mathilde Blind, H. E. Hamilton King, Christina G. Rossetti, Emily Pfeiffer, Frances Anne Kemble, Margaret L. Woods, Violet Fane, Adelaide Procter, Augusta Webster, Alice Meynell, Frances R. Havergall, Mrs. Alexander, Caroline Bowles, Dora Greenwell,

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Juvenile Books, by the following authors:—Julia Horatia Ewing, Mrs. Barbauld, Maria Edgeworth, Charles and Mary Lamb, M. Bramston, Maria Hack, Mrs. Trimmer, M. Wollstonecraft, Author of "Miss Toosey's Mission," Author of "Laddie," Mary Howitt, Jane Taylor, Mrs. Molesworth, Mrs. Humphry Ward, Agnes Strickland, Harriet Martineau, Grace Kennedy, Catherine Sinclair, Mrs. W. K. Clifford, Author of "Hon. Miss Ferrard," Charlotte M. Yonge, Ouida, Mrs. E. M. Field, Mrs. Sherwood, Grace Aguilar, Sara Coleridge, Maria Hack, Maria Louisa Charlesworth, Annie Keary, Alice Corkran, Mrs. Mozley, Lady Bellairs.

Historical, Biographical, and Miscellaneous, by the following authors:—Mrs. Hutchinson, George Eliot, Margaret Lonsdale, Sarah Tytler, Alice Meynell, Maria Edgeworth, Mrs. Planché, Mrs. Humphry Ward, Mrs. Francis Cresswell, Mrs. Oliphant, Miss Thackeray (Mrs. Richmond Ritchie), Mrs. Sheridan, Mrs. Chapone, Clara Reeve, Lydia T. Morris, Harriet Martineau, Lady Sale, Mary Hays, Mary Wollstonecraft (introduced by Mrs. H. Fawcett), Mrs. Henry Fawcett, Mary Carpenter, Mary Russell Mitford, Charlotte M. Yonge, Mrs. Whately, Mrs. Ellis, Mrs. Griffith, Mrs. Jameson, J. E. Harrison, Mrs. Kingsley, Mrs. Oliphant, L. Twining, Julia Cartwright, Marianne North, Lady Dilke, E. Lynn Linton, Mrs. Chas. Heaton, Mrs. Brightwen, Dr. Kate Mitchell, Beatrice Potter, Lady Colin Campbell, Octavia Hill, Constance Naden, Lady Morgan, D. G. Ritchie (editor), Mrs. Alexander Ireland, Margaret Stokes, Mrs. Gaskell, Caroline Fox, Agnes M. Clerke, Jane Strickland, Mrs. Sutherland Orr, Louisa Devey, Moy Thomas (editor), Charlotte Barrett, Vernon Lee, A. Hayward (editor), Margaret Howitt, Mathilde Blind, A. Thackeray Ritchie, A. Mary F. Robinson, Eliza Clarke, Mrs. Gilchrist, Bertha Thomas, Mary Hensman, Helena Faucit (Lady Martin), Frances Anne Kemble, Mrs. Cowden Clarke, Mrs. J. E. H. Gordon, Kate Norgate, Lucy Aikin, Lady Bloomfield, Mrs. Hamilton Gray, Sarah Brook, Mrs. Markham, Helen Zimmern, Hon. Emily Lawless, Lady Lamb, M. Hickson, Agnes Strickland, Mrs. R. Burton, Mrs.

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Travels, by the following authors:—A. B. Edwards, Lady Barker, Lady Brassey, Mrs. Fred. Barnaby, Celia Fiennes, E. Gerard, C. F. Gordon Cumming, R. Milner Barry, Margaret Fletcher, C. E. Acland-Troyte, Kate Marsden, Ethel St. Clair Grimwood, Mrs. Scott Stevenson, Mrs. Walker, Mrs. Carey-Hobson, Mémie Muriel Norman, Fanny Stenhouse, Author of "High Alps in Winter," Mme. de Bovet, Lady Dufferin, Isabella Bird (Mrs. Bishop), Mrs. A. St. Maur, Frances Elliot.

Music, by the following authors:—Kate Thompson, Lady Thompson, Oliveria Prescott, Hope Temple, C. A. Macirone, Alice Mary Smith (Mrs. Meadows White), Mary Augusta Salmond, Florence A. Marshall, Rosalind Frances Ellicott.

NEEDLEWORK

Presidents :

Lady HENRY GROSVENOR.

| Lady AMHERST OF HACKNEY.

Allote, Miss L., *Maltby Rectory, Alford, Lincolnshire.*

Plush border, worked flowers.

Allsop, A. G., *29 Sumner Place, Broughton Lane, Manchester.*

Plush and satin bedspread, art embroidery.

Anderson, Mary E., *37 St. Peter's Hill, Grantham, Lincolnshire.*

Doyleys, fine netting on fine linen.

Batt, Miss A., *Church Green, Witney, Oxon.*

Four pairs embroidered baby-shoes.

Bavin & Ormiston, *161 Friar Street, Reading.*

Sofa cushion, stole.

Benn, Mrs., *care of Mrs. Garnett, Crown Hotel, Windermere.*

Cushion cover.

Birkett, Miss, *care of Mrs. Garnett, Crown Hotel, Windermere.*

Table centre.

Birkett, Miss Jean, *care of Mrs. Garnett, Crown Hotel, Windermere.*

Chair back.

Bolton, Mrs., *Qta. des Maravillas, Funchas, Isle of Madeira.*

Oriental table cloth.

Boxwell, Miss, *19, Holbein Buildings, Sloane Square.*

Handkerchief sachet, crêpe work.

Boxwell, Miss, *19, Holbein Buildings, Sloane Square.*

Photo sachet, crêpe work.

Boxwell, Miss E., *19, Holbein Buildings, Sloane Square.*

Cushion cover, copied from dress worn by aunt of Sir Walter Scott.

Brett-Jeffares, Miss L. W., *care of Mrs. Brett-Jeffares, The Ring, Broadway, Wexford, Ireland.*

Mountmelick quilt.

- Brown, Miss C. M.**, *Whilbourne Lodge, Malvern, Worcestershire.*
Cushion cover.
- Buckle, Miss M.**, 41, *Deronda Road, Herne Hill.*
Cottage piano front.
- Childs, Miss Amy**, *Bowthorpe, Wisbech, Cambridgeshire.*
Baby robe.
- Clarke, Miss M. A.**, 54 *Fairlawn Street, Denmark Road, Manchester.*
Embroidered velvet mantel border.
- Cope, Mrs.**, 11 *Holbein House, Sloane Square.*
Copy Munich book cover, 14th century, macramé border, crimson velvet.
- Courtenay, Mrs. S. C.**, *Barrymore, Lesser Avenue, Clapham Common.*
Table centre.
- Crosthwait, Mrs. E.**, *Qtr. des Maravillas, Funchas, Isle of Madeira.*
Cushion, panel of screen.
- Davidson, Miss H. A.**, *The Parade, Castle Town, Isle of Man.*
Copy of old prayer-book cover.
- Digby, Miss**, 7 *Holbein Buildings, Sloane Square.*
Banner, Saint Cecilia (church work).
- Dillon, Mrs.**, *Mertry Hill House, Frome, Somerset.*
Art embroidery, two pieces.
- Dixon, Miss J.**, *Keldholme, Harrogate.*
Table centre.
- Dixon, Miss J. M.**, 63 *Grosvenor Terrace, East Parade, Harrogate.*
Portière, worked in jewels and silk.
- Elles, Miss M. C.**, 12 *Ridgway Place, Wimbledon, Surrey.*
Piece of embroidery.
- Erskine, Mrs. Z.**, *Greenhill House, Warminster.*
Curtain, old design.

Ffennell, Miss, *Sec. Royal School Art Needlework, South Kensington.*

Fourfold screen, Elizabethan Bible and case, cushion, old Italian embroidery cushion, yellow satin couvrette, copy old Italian stool, copy old Italian table cover, handkerchief sachet, brush cover to match, pincushion, blotter, copy Spanish on vellum; casket, copy old English; kid frame, gold work; specimen of curtain ordered by Her Majesty, tapestry room, Windsor Castle; Pomona, wall hanging; teacloth, white linen photo frame, blue linen blotter, blue linen blotter, Kirriemuir twill photo frame, blue linen.

Flegg, Miss C. M., *Pasture Cottage, Dersingham, King's Lynn, Norfolk.*

Nightdress, netted d'oyleys.

Froud, Miss M., *Seymour Lodge, Richmond Hill, Bournemouth.*
Silk pulpit hanging.

Garde, Miss H. M., *Ballymatre Cottage, Cheyne, Co. Cork, Ireland.*
Feather sprays.

Gardner, Miss E. M., *1 Belmont, Ilfracombe, Devon.*
British moths, worked silks, in oak case.

Garnett, Miss A., *Crown Hotel, Windermere.*
Cushion cover, tea cloth.

Garnett, Miss W., *Crown Hotel, Windermere.*
Mantel cloth, copy of Oriental work.

Goslin, Miss, *Firth's Nursing Association, 123 New Bond Street, W.*
Tablecloth, crochet border.

Gowan, Miss, *Sec. Ladies' Work Society, 31 Sloane Street.*

Cushion designed by H.R.H. Princess Louise, photo-screen designed by H.R.H. Princess Louise; prayer and hymn-book, linen; prayer and hymn-book; mirror, frame designed by H.R.H. Princess Louise; tablecloth, blue satin.

Green, Miss Annie, *Park Road, Dewsbury.*

Eis wool shawl.

Hainsworth, Miss C. D., *Starbeck, Harrogate, Yorks.*
Night-dress sachet and brush bag.

Halsham, Mrs. L., 36 *Harrold Mount, Queen's Road, Leeds.*

Shepherd and sheep worked by Lady C. T. Clive, governess to H.M. the Queen.

Harris, Miss R., *Rosemarne, Waldeck Road, Castle Hill, Ealing.*

Afternoon tea cloth.

Hayden, Mrs. W., *Nant ye Eghoys, Whitland, R.S.O., South Wales.*

Embroidered quilt, two nightdress bags.

Henry, Miss J., 50 *Tower Street, Portobello.*

Highland stockings.

Herbert, Miss, *Lower Cousley Wood, Wadhurst, Sussex.*

Knitted pincushion.

Hinton, Miss L., *The Til, Madeira.*

Sofa back on linen.

Holiday, Mrs. C., *Oaktree House, Branchhill, Hampstead.*

Embroidered portière.

Huxley, Miss M., 12 *Cheyney Lane, Chester.*

Virgin and Child, embroidered; Good Shepherd, embroidered.

Innes, Mrs. Mitchell, *Frome.*

Border for court train.

Irish Women's Work Society, *Hollyrood, co. Down, Ireland.*

Pink quilt, sheet and pillow shams, shamrock table centre, gold silk worked quilt.

Jameson, Miss M. A., *Oak Cottage, Burneside, Kendal.*

Child's muslin pinafore.

Kendall, Miss A. J., *Coastguard's Station, Penzance.*

Embroidered handkerchief.

Kennard, Miss, *Marmhull, Blandford, Dorset.*

Embroidered sofa cushion.

Kent, Miss, 33 *New Street, Salisbury.*

Centre design for altar frontal.

Keown, Miss, *Red House, Castleloe, Coleraine Ireland.*

Silk screen panel.

Kidd, Miss M. M., *Cherry Bank, Perth, N.B.*

Knitted stockings.

Knight, Miss M., 38 *South Street, Chelsea.*

Patchwork Scripture text quilt (to be given to a charity after exhibition).

Lea, Mrs., *Orford Mount, Urmston, near Manchester.*

Linen photo frame.

Lucas, Miss A., *Rose Cottage, Hitchin.*

Two altar superfrontals, sofa back.

Macgregor, Miss I., 17 *Gunterstone Road, West Kensington, London.*

Needlework done at widows' industrial class at Amritsar, Peshawur; eight pieces Indian work.

Macpherson, Miss L., care of *Dr. Payne, 78 Wimpole Street, London.*

Embroidered curtain.

MacRae, Miss S., *Kames Castle, Rothesay, N.B.*

Tartan hose.

Maples, The Misses H. & E., *Elmsford House, Spalding.*

Fish scale embroidery, banner screen, table centre.

Mercier, Mrs. J., G.F.S., *Home of Industry, Tewkesbury.*

Chemise, chalice veil, socks, towel, pillow case.

Miller, Mrs. W. F., *Summerfield, Sidcot by Weston-super-Mare.*

Bed or piano cover.

Mitford, Miss E. B., 33, *York Street, Portman Square, W.*

Green silk stole.

Molineaux, Misses, 227 *Milkwood Road, Herne Hill.*

Six pairs of baby-shoes.

Morant, Miss L., 10 *Victoria Terrace, Weymouth.*

Mounted worked fan.

Morris, Miss May, 8 *Hammersmith Terrace, W.*

Coverlet for bed.

Newton, Miss I., *Mount Leinster, Killedmond, Co. Carlow, Ireland.*

One curtain.

Nicholson, Mrs. A. J., 2 *Ashton Lawn, Blackrock Road, Cork, Ireland.*

Linen cot quilt, portière, couvrette.

Noble, Miss M. G., 61 *West Street, Hull, Yorks.*

Patchwork quilt (15,682 pieces).

Noedel, Miss, *H.R.H. Princess of Wales' Technical School, Sandringham.*

Two aprons, two overalls for artists, two blouses.

Paget, Mrs. K. M., 129, *Victoria Street, London.*

Two pieces copy old Turkish embroidery, one Ruskin linen embroidery.

Palmer, The Misses Felise, *The Avenue, Datchet, Windsor.*

Cushion-cover, two children's smocks, Greek lace cushion cover.

Parkinson, Miss M., 52 *Buckingham Road, Brighton.*

Coral embroidery.

Phelps, Miss A. J., *care of Mrs. Case, Sudbury House, Farringdon, Buckinghamshire.*

Samples of darning.

Purvis, Miss, *The Close, Salisbury.*

Stole, surplice.

Pye, Mrs. Walter, *Viewfield, Stirling.*

Portière, bodice trimmings.

Randall, Miss, *Birchfield Langley, Slough.*

Embroidered quilt.

Rigg, Miss M. B., *Glastonbury, Kew Gardens.*

Cushion.

Russell, Miss R., 59 *Eaton Square, London, S.W.*

Worked pictures.

Saunders, Miss F. H., *Golden Fort, Baltinglass, Co. Wicklow, Ireland.*

Sideboard cloth, Mountmellick work.

Saunders, Miss L., *Golden Fort, Baltinglass, Co. Wicklow, Ireland.*

Toilet cover.

Scott, Miss A., 5 *Guildford Place, Russell Square, London.*

Poker work.

Sharp, Miss C., 3 *The Croft, Barnet, Hertford.*

Knitted ladies' stockings.

Shepard, Miss A., 23, *Portland Terrace, Regent's Park, London, N.W.*

D'oyleys, brackets.

Sheppard, Mrs., *St. David's, Surbiton, Surrey.*

Strip for table.

Sherlock, Mrs., *Castletown, Isle of Man.*

D'oyleys.

Smallwood, Miss, *The Lees, Great Malvern.*

Cushion.

Smith, Miss M. A., 10, *Kensington Court Mansions, London, W.*

Chair backs (3), table cloth, fan, blotter.

Stone, Miss L., *care of F. Gale, Esq., Leigham Avenue, Streatham.*

Bamboo mounted screen.

Superioress, *Convent of Mercy, Abingdon, Berks.*

Hood of cope.

Thompson, Miss, *Aldcliffe Road, Lancaster.*

Tea cloth.

Thompson, Miss E., *Aldcliffe Road, Lancaster.*

Netted bags (6).

Tobin, Miss E. G., *Eastham House, Cheshire.*

Copy of old christening quilt, antependium, Shropshire boy's smock.

Tracy, Miss. J. F., *Shrub House, Foxhall Road, Ipswich, Suffolk.*

Fish scale embroidery.

Walker, Miss E., *Robin Hood, near Birmingham.*

One sample, the "Months," by Walter Crane, in needlework.

Walmsley, Miss A., *Pension Felsberg, Lucerne, Switzerland.*

Table cloth.

Webster, Mrs., 4, *Mayfield Terrace, Edinburgh.*

Tartan socks.

Webster, Mrs., *Wemyss School of Needlework, Wemyss, E. Fife.*

Piece satin embroidery, design found on Queen Antoinette's tambour frame at Le Petit Trianon.

Welch, Miss E., 264, *St. Pancras Road, Canonbury.*

D'oyley.

Westrope, Miss M. E., 8, *Victoria Square, Clifton, Bristol.*

Dinner cloth, table cover, melon seed work.

Wheeler, Miss M., *Eardington, Bridgenorth, Shropshire.*

Tablecover.

Whitehead, Mrs., 7, *Chatham Place, Ramsgate.*

Tea cloth, d'oyley.

Winks, Mrs. Foulkes, *Ravenslea, Water Lane, Brixton.*

Chemise, lace top.

Woodward, Miss E. C., 194, *Beaufort Street, Chelsea, London, S.W.*

Worked Bible cover.

NURSING.

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Autograph portrait of Her Majesty the Queen, patron of Queen Victoria's Jubilee Institute for Nurses; portrait of H.R.H. the late Grand Duchess of Hesse, Princess Alice of Great Britain and Ireland; portraits of H.R.H. Princess Christian of Schleswig-Holstein, Princess Helena of Great Britain and Ireland, President of the Royal British Nurses' Association.

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Padded splints. Bandages. Surgical dressings. Cut dressings, prepared for surgeons. Items of comfort for the sick.

Surgical appliances used by nurses.

Hygienic clothing for nurses. Appliances in use by district nurses. Appliances in use for private nurses. Dietary service for the sick. Nurses' uniforms, caps, bonnets. Gallery of celebrated nurses. Medals, badges and decorations awarded to nurses. Certificates of British nurse-training schools. Nursing library.

Bust of H.R.H. Princess Christian, President of the Royal British Nurses' Association. Bust of Roheré, founder of Saint Bartholomew's Hospital, A.D. 1122.

Statue of Sister Dora. Personal effects of Sister Dora.

Invalid appliances and furniture designed by nurses.

Models of medical and surgical treatment designed by Sister Marion, Homeopathic Hospital, M.R.B.N.A. Papier-maché model of Leper Colony, Yakoutsk. Miniature models of the Pridgin-Teale for excluding dust from rooms, cupboards, etc.

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Type-Written Reports on the Philanthropic Work of Women, classified under the following subject-headings:—

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GIRLHOOD.

Section I.—Social and protective work, and providing employment.

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WOMEN.

Section I.—Improving or ameliorating their condition.

Section II.—Rescue and reformatory work.

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Women's work in connection with Roman Catholic and various Nonconformist bodies, and many institutions throughout Great Britain.

Women's work in connection with the Church of England, as shown by lists and reports of societies carried on in different dioceses.

Reports on various diocesan organisations.

AMELIORATION OF THE CONDITION OF THE WORKING CLASSES.

WOMEN AS POOR LAW GUARDIANS.

WORKING GUILDS AND WORK SOCIETIES.

BLIND, DEAF AND DUMB; AND CARE OF THE HELPLESS.

NURSING.

WORK AMONG BRITISH SOLDIERS.

WORK AMONG BRITISH SAILORS.

TECHNICAL AND OTHER EDUCATIONAL WORK.

PHILANTHROPIC WORK OF WOMEN IN IRELAND.

PHILANTHROPIC WORK IN THE COLONIES AND ABROAD.

MODELS AND SPECIMENS OF HANDICRAFT WORK.

Model of a children's holiday home; connected with the Ragged School Union.

Model of a crèche; connected with the Ragged School Union.

Model of a window decorated with flowers from the London Flower Girls' Mission.

Model of a London cabmen's shelter; decorated with artificial flowers made by the London Flower Girls' Mission.

Beaten brass letter box; from Miss Wingfield Digby's brass-work class, Bournemouth.

Beaten brass letter tray; from Miss Wingfield-Digby's brass-work class, Bournemouth.

Carved wood letter box; from the Hon. Odeyne de Grey's Ratcliffe carving class, East London.

Iron kettle stand (made by George Mare, labourer, adult), small wrought-iron lamp (made by Miss Maude), wrought-iron hinge

(made by Charles Gillard, coachman's son, age 15), bracket (made by Thomas Lock, age 16, labourer), candlestick (made by William Gillard, age 15, coachman's son); all from Miss Maude's village iron-work class, Curry Rivel, Somerset.

Specimens of artificial flowers for decorating dresses, and other purposes, from the London Flower Girls' Mission.

Carved wood platter and carved wood work basket, from Miss Ferguson's industrial classes, West Linton, Scotland.

Specimens of Work from the following Industrial Institutions affiliated to the Society for Promoting Female Welfare:

ALFORD NEEDLEWORK ASSOCIATION.

PORTMAN CHAPEL WORK SOCIETY.

WEST HOLME, HOUNSLOW (Miss Pollock's Inebriates' Home).

HALSTEAD INDUSTRIAL HOME.

"DIGBY INSTITUTE," BOURNEMOUTH (Y.W.C.A.).

THE CRIPPLES' HOME AND INDUSTRIAL SCHOOL FOR GIRLS, LONDON.

THE CRIPPLES' NURSERY, LONDON.

ITALIAN PROTESTANT ORPHANAGE, FLORENCE.

INDIGENT BLIND VISITING SOCIETY, LONDON.

INDUSTRIAL HOME FOR GIRLS, LONDON.

SOUTH GROVE HOME SCHOOL, TUNBRIDGE WELLS.

CHINESE BIBLE MISSION TO WOMEN AND CHILDREN.

EPSOM MISSION ROOM WORK SOCIETY (MISS ALEXANDER).

ILLUMINATED TEXT MISSION.

IRISH INDUSTRIES.

Design in Mrs. O'Brien's Limerick black silk lace for a fan; sent by Mrs. Rogers, of Sevenoaks.

Handkerchief case from Mrs. Vesey's Dunleckney cottage industry, Ireland.

Embroidered apron, embroidered child's pinafore, embroidered cushion trimmed with lace from Co. Donegal, from Mrs. Bagwell's Marlfield cottage industry, Ireland.

White drawn d'oyleys, table cover drawn blue, table cover embroidered in silks; from Mrs. Ponsonby's Garry Hill girls' class, Ireland.

Specimens of work from Miss Stewart's knitting and embroidery class, Ballyardle, Co. Down.

Specimens of the peasant knitting industry at Carna.

Specimens of grey serge, natural wool and Irish flannel, from Mrs. Bernard's Providence Technical Woollen Manufactory, Foxford, co. Mayo.

LACE, EMBROIDERY, NEEDLEWORK.

Specimens of work done by blind children.

Specimens of Moravian satin stitch and other stitches worked at the Sisters' House, Fairfield, near Manchester.

Specimens of lace from the Association for the Encouragement and Improvement of Handmade Pillow Lace for the Counties of Northampton, Buckingham and Bedford:—

Princess Beatrice lace.

Hand-made pillow lace.

Maltese lace handkerchief.

Torchon linen lace for sheets and pillow cases.

Narrow baby lace and insertion; point grenard.

Old point.

Satin embroidery, from Miss Ensor, Norwich.

Sample of knitted hosiery from St. Chad's Home for Waifs and Strays, Leeds.

Patchwork quilt done by a cottager; from Miss Fergusson's industrial classes, West Linton, Scotland.

Stockings knitted in wool and silk; from Miss Steer's Bridge of Hope, London.

Specimen of work from London Soho Club for Working Girls: banner by Agnes Robertson, a worker at Crosse & Blackwell's jam factory; samples of art needlework stitches, by Harriet Alcock, a clerk; sent by the Honble. Maude Stanley.

Specimens of work from the Ragged School Union.

PICTURES AND PHOTOGRAPHS.

Two photographs of Gordon Hall, Mildmay Boarding House, Deaconess House, and Missionary Training Institute at Liverpool; sent by Mrs. Stephen Menzies, foundress of that branch of the Y.W.C.A. Photograph of Mrs. Ponsonby and of her girls' class, Garry Hill; sent by Mrs. Ponsonby.

Two photographs of Halstead Industrial School; sent by Miss Greenwood.

Photograph of the Meath Home for Epileptics.

Photographs of Miss Steer's Bridge of Hope, East London.

Grants, Doles and Charities in the County of Norfolk, illustrated with engravings of churches, &c.; from Miss Ensor, Norwich.

Water-colour sketch of a lace-maker in the village of Pitsford, Northamptonshire.

Sketches illustrating the work in India of the Marchioness of Dufferin and Ava.

Pictures by students of the Art Students' Home, Brunswick Square, London.

First Conviction under Martin's Acts ("The Animals' Charter"); from the R.S.P.C.A.

MAPS.

Map of London, showing the districts in which common lodging-houses are situated. (From the Lodging House Mission.)

Map of London, showing the dining rooms supplying dinners for poor children. (In connection with the Destitute Children's Dinner Society.)

BOOKS.

Adelaide, Year Book (1892) of Church of England in the Diocese of Aldershot; a record of Mrs. Daniell's work among the soldiers. By Miss Daniell.

Associated Workers' League, 1892.

Biblewomen and Nurses; a record of the work of the London Bible and Domestic Female Mission.

- Blind, Elizabeth Gilbert, and her work for the. By Frances Martin.
- Blue Jackets, Our; a narrative of Miss Weston's life and work among our sailors. By Sophia G. Wintz.
- Catholic Directory; Ecclesiastical Register and Almanac for 1892.
- Church of England Year Book for 1892.
- Countess of Huntingdon and her connexion. By Rev. J. G. Figgis.
- English Women and their work in Queen Victoria's reign, 1857-1887. By Miss Hubbard.
- English Women's Year Book and Directory, the.
- Friends; Extracts from Minutes of Proceedings of Yearly Meeting, 1891.
- Friends; First Day School Association, 1891.
- Friends' Foreign Mission Association, 1891.
- Friends; Report of the Home Mission Committee to the Yearly Meeting, 1891; and Report of Addresses at Meeting at Devonshire House, 1891.
- Friends' Syrian Mission, 1892.
- Girls' Friendly Society; Associates' List, 1892.
- Girls, What to do with Our; or Employment for Women. By A. T. Vanderbilt.
- Melbourne; Work of Private Persons and Societies under the Neglected Children's Act, 1890, for the years 1890-1891.
- Moravian Church Book, The.
- New South Wales; Statistical Register for 1891, and previous years.
- Nurses' Directory for 1892.
- Poor Sisters of Nazareth, The; Hammersmith. By Alice Meynell.
- Sanitary Association, The Ladies'. 6 vols.
- Spurgeon's, Mrs., Book Fund and its Work. 3 vols., 1887, 1889 1890.
- Victoria; Charitable Institutions; Report of the Royal Commission, 1891.
- Victoria; Department for Neglected Children and Reformatory Schools, 1890. By the Secretary.
- Women Workers; Papers read at a Conference convened by the Liverpool Ladies' Union of Workers among Women and Girls, 1891.

IRELAND.

President: COUNTESS OF ABERDEEN.

In conjunction with the Irish Industries Association.

Cappoquin, Miss Keane's Industry.

Reticella lace; raised point lace.

Carrickmacross Industry.

Bridal dress of white poplin and gold brocade trimmed with "appliqué" lace; bridal veil, fan and handkerchief to match.

Clones Lace-making District.

Lifted and knotted guipure crochet; silk crochet; white crochet, "point d'Irlande."

Connemara Peasant Woman.

White embroidered baby's robe.

Dublin, Cabra Convent Industry.

Bridal set complete (lace).

Dublin, Golden Bridge Convent Industry.

Tambour lace alb.

Garryhill Cottage Industry, and Mrs. E. Ponsonby.

Embroidered tea-cloths.

Innishmacsaint Lace Industry.

Raised needlepoint lace.

Irish Distressed Ladies' Fund.

Embroidered vestments.

Kenmare, Convent of Poor Clares.

Needlepoint flouncing; one set embroidered vestments.

Kinsale, Convent of Mercy.

White tambour lace flouncing; bordering; handkerchiefs.

Limerick, Convent of Good Shepherd.

Tambour lace alb.

Limerick Lace-making School.

Creme blonde lace scarves.

Limerick, Mrs. Vere O'Brien's Industry.

Bassinette with flounce, cover and curtains of tambour lace, with basket; bridal veil in tambour lace; black and white run lace; cream tambour lace scarves.

Newry, Convent of Mercy.

Tambour lace alb.

New Ross, Carmelite Convent.

Needle-point flouncing, crochet, Jesuit-point.

Parsonstown, St. John's Industry.

Point lace flounce, fan and handkerchief.

Royal School of Art Embroidery.

Embroidered vestments.

Turbotstown Cottage Industry (Miss Dease).

Embroidered linen quilt.

Youghall, Presentation Convent.

Needle-point flouncing.

SCOTLAND.

President: COUNTESS OF ABERDEEN.

In conjunction with the Scottish Home Industries Association.

Secretaries:

Miss MUNRO FERGUSON.

Miss META DONALD.

ARTS.

Anderson, Miss, *Barskinning, Mauchlin, Ayrshire.*

Bent ironwork mirror.

Butcher, Mrs., *27 Palmerston Place, Edinburgh.*

Inlaid box.

Dempster, Miss, *6 Albert Place, Stirling.*

Inlaid blotter.

Ferguson, Mrs. Munro, *Assynt, Novar, N.B.*

Design for fan.

Gillan, Miss E., 18 *Wellington Square, Ayr.*

A hand-painted tea set.

Graham, Miss, *Gower House, Crieff, N.B.*

Case of filigree work.

Hamilton, Mrs. Vereker, 41 *Circus Road, St. John's Wood, London.*

Case of bronze medallions. (For sale, apply artist).

Harvey, Misses, *Rosemount, Tain, N.B.*

Carved table; carved clock case; carved bellows.

Perman, Miss, 131 *West Regent Street, Glasgow.*

Draught screen.

School of Domestic Economy, *Athol Crescent, Edinburgh.*

Specimen diploma, &c., &c.

Thompson Anstruther, Miss, *Charlton, Colinsburgh, N.B.*

Arab frieze.

Traquair, Mrs., 3 *Dean Park Crescent, Edinburgh.*

1. Photographs of illuminated vellum manuscript of Tennyson's "In Memoriam," bound in cover also designed and worked by Mrs. Traquair. 2. Frame containing two of Mrs. Browning's sonnets, illuminated.

Tytler, Miss Fraser, *Auchendinning House, Milton Bridge, N.B.*

Statuette, "A mud-lark"; tracings of ships' plans.

Warrack, Miss, 4 *Carlton Terrace.*

Brass tray.

EMBROIDERIES.

Gillan, Mrs., 18 *Wellington Square, Ayr.*

Wall panel; table cover.

Gillan, the Misses, 18 *Wellington Square, Ayr.*

Drapery; bedspread; cushion; cot cover; mantel border.

Haddo School of Needlework (Miss Sandison).

Embroidered peacock.

Houston, Women of (*Manageress, the Lady Anne Spiers, Houston House, Renfrewshire.*)

Toilet; teacloth; Houston embroidery.

Royal Repository for Gentlewomen's Work, 32 Frederick Street, Edinburgh.

Specimens of work.

OLD EMBROIDERIES.

Lent by the Countess of Aberdeen.

Embroidery, worked by Anne, Countess of Aberdeen, 1740.

Lent by Mrs. Morrison Duncan, of Norton.

Portion of ancient hanging in green velvet, embroidered with raised needlework design, a style specially used in Scotland during the latter Stuart reigns.

Specimen of old muslin curtain border embroidered by Mrs. Catherine Mackenzie, along with two similar examples of last century Scottish curtain work.

Specimen of beautiful old ruffle needlework, as worn on last century dresses.

Fragment of old Scottish drawing-room coverings embroidered early this century on homespun linen, with specimens of the woollen and flax (unbleached) threads employed.

Ancient pocket-book, worked with green and gold threads on canvass in one of the old Scottish book-cover stitches.

Scottish screen, embroidered early this century with the Nicholson arms.

Two bags of Fair Isle knitting along with two Spanish bags bought in Valencia market-place, to show their similarity.

Scarf in Scottish needle lace, date early this century; framed piece of old style embroidery executed in coloured threads on linen.

Lent by the Countess of Strathmore, Glamis Castle, N.B.

Piece of embroidery from the bed of Patrick, Earl of Kinghorn, worked with his arms, about the year 1606.

HOME INDUSTRIES.

Aberdeen, Women of.

Knitted gloves.

Ayrshire School of Art and Women's Industries
(*Manageress, Hon. Mrs. Vernon, 36 Newmarket Street, Ayr.*)

Portière; screens; embroidery; panel or over-mantel, copy old Italian; satin tea-cosy.

Gairloch, Women of (*Manageress, Lady Mackenzie, of Gairloch, N.B.*)

Hand-knitted stockings of different patterns; homespun wool.

Harris, Women of (*Manageress, Lady Scott, North Harris*).

Suit lengths of homespun and woven tweeds; cloak; patterns of Harris tweeds; spinning wheel.

Shetland, Women of (*Manageress, Mrs. Lyell, Kinordy, Kirriemuir, N.B.*).

Specimens of finest knitting.

Stevenson, Miss.

Knitted gloves; Victoria tartan.

LACE.

Greig, Mrs., 44 Skene Terrace, Aberdeen.

Pitsligo lace handkerchief; length of lace; specimens of lace.

WALES.

President: Lady ABERDARE.

Hon. Sec.: Miss ADEANE.

WOMEN'S INDUSTRIES FROM NORTH WALES.

Adeane, Miss, Llanfawr, Holyhead.

Lay figure, dressed in the national costume of North Wales, Welsh costume with high hat, Welsh aprons, various colours; Anglesey wool spinning wheel, Anglesey flax spinning wheel; specimens of homespun flax and wool, woven specimens, silk and wool.

Anglesey (Women of).

Hand-knitted stockings, different patterns, such as "fish-bone," "cable" and other local designs.

Denbigh (School Child of).

Sampler of marking as done in a Welsh school.

Home Art Centre, Holyhead.

Bed coverlet, design worked in ivory colour on Venetian red (M. Elliott).

Curtain, one of set reproduced from XVII. century four-post bed (dark green on linen ground) (C. Lewis).

Sampler of stitches used in old embroidery; sheet and pillow cases for child's cot (white design on linen) (E. Elliott).

Mirror from original (Henry VIII. time) (K. Sharpe).

Silver-backed brush (P. Crosse).

Hand-glass (A. M. Edwards).

Copper tray; leather blotting-book (E. Edwards).

Owen, E., Fferam Fawr, Tycroes.

Spinning wheel for wool and flax.

Parry, Catherine, Presadfad.

Welsh wigs, as worn by old people in Wales.

Williams, Jane, Aberfraw, Anglesey.

Baskets made of grass grown on Newborough Sands.

WOMEN'S INDUSTRIES FROM SOUTH WALES.

Hand-loom for flannel weaving as done by women in South Wales (lent by Messrs. Parry and Rock).

Samples of Welsh flannels made by women with these looms in cottages.

Spinning wheel for wool (sent by Lady Llewelyn).

Dressed figure in costume of Swansea cockle woman (sent by Lady Llewelyn).

Welsh coverlids quilted by women in their own homes.

Hand-knitted stockings in different sample stitches.

Stockings, machine-made by girls in Messrs. Parry and Rock's woollen factories.

Samples of Welsh flannels woven by women in Messrs. Parry and Rock's establishment.

PORTRAITS OF EMINENT BRITISH WOMEN.*In Mediæval Period.*

St. Eadgitha, or Edith, of Wilton. Daughter of King Edgar, died 984. Pen and ink drawing of effigy from seal of Wilton Abbey.

Devorguilla of Baliol. Founder of Baliol College, Oxford, died 1267. Pen and ink drawing of effigy from seal attached to the statutes of the college.

Ela, Countess of Salisbury. Wife of Wm. Longespe, lived 1188–1261; Abbess of Lacock, 1240–1258. Pen and ink drawing of effigy from seal used by her when filling office of High Sheriff of Wiltshire, after husband's death.

Eva de Braose. Died 1246. Lithograph from monument in St. Mary's Church, Abergavenny.

Eva de Cantilupe, Baroness of Abergavenny. Died 1257. Lithograph from monument in St. Mary's Church, Abergavenny.

Elizabeth of Clare, Countess of Ulster. Founder of Clare College, Cambridge, died 1340. Engraving.

Mary de St. Paul, Countess of Pembroke. Founder of Pembroke College, died 1377. Pen and ink drawing after painting at Cambridge; also one after an old illumination.

Margaret of Anjou. Wife of Henry VI., founder of Queen's College, Cambridge, died 1482. Pen and ink drawing after an old illumination.

Margaret Beaufort, Countess of Richmond and Derby. Mother of Henry VIII., founder of Christ's College, Cambridge, lived 1441–1509. Engraving from picture in collection of the Earl of Derby.

Frances Sydney. Founder of Sydney College, Cambridge, died 1588. Engraving after a picture in the College.

Juliana Berners. Prioress of Sopwell, near St. Albans, elected about 1480. Engraving.

Elizabeth Hervey. Abbess of Elstow, Bedfordshire, elected about 1520. From monumental brass.

Agnes Jordan. Abbess of Syon, elected 1534. From monumental brass.

Esther Inglis. Flourished towards close of 16th century. From MS. of the Proverbs of Solomon, at the Bodleian Library, Oxford.

Dorothy Wadham. Founder of Wadham College, Oxford, died 1618, aged 84. Pen and ink sketch after prints in British Museum.

In Tudor Period.

Queen Mary. Lived 1515-1558. Engraving after Sir Antonio More.

Queen Elizabeth. Lived 1533-1603. Engraving.

Mary Queen of Scots. Engraving after picture in St. James's Palace.

Jane Seymour. Engraving after Holbein.

Anne Boleyn. Engraving after Holbein.

Catherine Parr. Engraving after Holbein.

Margaret Roper. Daughter of Sir Thomas More, the Chancellor lived 1508-1544. Engraving.

Anne Askew. Lived 1521-1546 ; burned at the stake in Smithfield, July 16th, 1546. Photograph of picture in possession of Sir Richard Cholmondeley.

Jane Heddington (Mrs. Cecil). Mother of the great Lord Burleigh. Photograph from picture in possession of the Marquis of Salisbury.

Mildred Coke, Lady Burleigh. Daughter of Sir Anthony Coke, lived 1526-1589. Photograph from picture in possession of the Marquis of Salisbury.

Lady Jane Grey. Lived 1537-1554. Engraving.

Mary Sidney, Countess of Pembroke. Sister of Sir Philip Sidney, lived about 1550-1621. Engraving after picture of Mark Gerards.

Lady Arabella Stuart. Lived 1575-1615. Engraving after Van Somer.

In Civil Wars.

Elizabeth Steward (Mrs. Cromwell). Mother of Oliver Cromwell, died 1654. Engraving after an old picture.

Anne Clifford, Countess of Dorset, Montgomery, and Pembroke. Hereditary High Sheriff of Westminster, lived 1589–1675. Engraving from picture in collection of the Duke of Dorset.

Charlotte de la Tremouille. Wife of Sir James Stanley, Earl of Derby, died 1663. Engraving after Vandyke of the Earl, the Countess, and her son.

Jane Lane. Afterwards Lady Fisher, died September 9, 1689. Photograph from picture.

Flora Macdonald. Died 1790. Engraving after portrait by Alan Ramsay.

Lady Fanshawe. Lived 1625–1680. Photograph from picture by Sir Peter Lely.

Mrs. Lucy Hutchinson. Wife of Colonel Hutchinson. Engraving.

Lady Rachael Wriothesley. Wife of Lord William Russell, daughter of Sir Thomas Wriothesley, Earl of Southampton, lived 1636–1723. Engraving after picture at Woburn Abbey.

In Early Half of XVIIIth Century.

Queen Mary. Lived 1662–1694. Engraving after Sir Godfrey Kneller.

Queen Anne. Lived 1665–1714. Engraving after Sir Godfrey Kneller.

Sarah Jennings, Duchess of Marlborough. Lived 1660–1744. Engraving after Sir Godfrey Kneller.

Margaret Lucas, Duchess of Newcastle. Died 1673. Daughter of Sir Charles Lucas. Engraving.

Mrs. Pope. Mother of the poet. Etching from a drawing at Strawberry Hill.

Anne Donne (Mrs. Cowper). Mother of the poet, died 1737. Etching by Blake.

Elizabeth Rowe. Writer of religious works. Lived 1674–1735. Engraving.

Mrs. Wesley. Mother of John and Charles Wesley.

Selina, Lady Huntingdon. Lived 1707-1791. Engraving.

Elizabeth Carter. Lived 1717-1806. Engraving after Sir Thomas Lawrence.

Lady Mary Wortley Montagu. Lived 1720-1800. Engraving.

Mrs. Montague. Lived 1720-1800. Engraving.

Mrs. Chapone. Lived 1727-1801. Engraving.

Hannah More. Lived 1745-1833. Engraving.

Pioneers in Philanthropy and General Advancement of Women.

Elizabeth Fry. Lived 1780-1845. Photograph from picture by Richmond.

Hannah More. Lived 1745-1833. Engraving from portrait by Pickersgill in Nat. Portrait Gallery.

Mary Wolstonecraft Godwin. Lived 1759-1797. Photogravure after Opie.

Lydia Ernestine Becker. Lived 1827-1890. Photograph.

Millicent Garrett Fawcett. Photogravure.

Mary Carpenter. Lived 1807-1877. Pen and ink sketch from photograph.

Mrs. Nassau Senior. Lived 1829-1877. Photograph from portrait by Watts.

Florence Nightingale.

Sister Dora. Lived 1832-1878. Photograph of statue at Walsall.

Dr. Elizabeth Blackwell. Photograph.

Dr. Elizabeth Garrett-Anderson. Photograph.

Caroline Chisholm. Lived 1810-1877. Woodcut.

Miss Marsh. Photograph.

Miss F. A. Robinson. Photograph.

Miss Weston. Photograph.

Mrs. Ranyard. Photograph.

Mrs. Meredith. Photograph.

Mrs. Josephine Butler. Photograph.

Mrs. P. A. Taylor. Photograph.

Miss Rosamond Davenport Hill. Photograph.

Miss Florence Davenport Hill. Photograph.

Mrs. Ashworth Hallett. Photograph.

Miss Caroline Ashurst Biggs. Died 1889. Photograph.

Mrs. Priscilla Bright McLaren. Photograph.

Miss Isabella M. S. Tod. Photograph.

Mrs. Anna Haslam. Photograph.

Miss Flora Stevenson. Photograph.

Pioneers in Education.

Lady Stanley of Alderley. Photograph.

Barbara Leigh Smith (Madame Bodichon). Died July 11th, 1891. Photograph from painting by Miss Osborn, at Girton College.

Miss Emily Davies. Photograph from portrait at Girton College.

Miss Anne Jane Clough. First Principal of Newnham College. Lived 1820–1892. Photograph from portrait by Shannon, at the College.

Eleanor Mildred Balfour (Mrs. Henry Sidgwick). Principal of Newnham College. Photographed from portrait by Shannon, at the College.

Mrs. Jellicoe. Founder and First Principal of Alexandra College, Dublin; died 1880. Photograph.

Mrs. Wm. Grey } Founders of National Union for Education of
Miss Shirreff } Women. Photographs.

Miss Wordsworth. Principal of Lady Margaret Hall, Oxford. Photograph.

Miss Beale. Founder and Principal of Cheltenham Ladies' College. Photograph.

Miss Buss. Founder and Principal of North London Collegiate School. Photograph.

Mrs. Byers. Founder and Principal of Victoria College, Belfast. Photograph.

Mrs. John Elder. Founder of Queen Margaret College, Glasgow
Woodcut.

Philippa Fawcett. "Above the Senior Wrangler," July, 1890.
Photogravure.

Central Group.

H.M. Queen Victoria. 1887.

H.M. Queen Victoria. 1837.

H.M. Queen Victoria as Princess Victoria. 1832.

H.M. Queen Victoria as Princess Victoria. 1829.

The Empress Frederick. Engraving after Winterbottom in
1858.

The Princess Alice. Engraving, 1860.

The Princess Christian. Engraving.

In Science, History, &c.

Anna Brownell Murphy (Mrs. Jameson). Lived 1794-1861.
Photograph from bust by Gibson, in National Portrait Gallery.

Mary Fairfax (Mrs. Somerville). Lived 1780-1872. Engrav-
ing after portrait in National Portrait Gallery.

The Marchioness of Salisbury. Photograph.

The Marchioness of Dufferin and Ava. Photogravure.

Harriett Martineau. Lived 1802-1876. Engraving after portrait
by Margaret Gillies.

Frances Power Cobbe. Photograph.

Anna Swanwick. Photograph.

Agnes Strickland. Lived 1797-1874. Engraving after portrait
in National Portrait Gallery.

Catherine Winkworth. Died 1878. Photograph.

Susanna Winkworth. Died 1885. Photograph.

Amelia Blandford Edwards. Died 1892. Photograph.

Matilda Betham Edwards. Photograph.

Jane Harrison. Photograph.

Miss Ormerod. Photograph.

In General Literature.

Mrs. Howitt. Lived 1805–1885. Engraving.

Mrs. Piozzi. Lived 1769–1852.

Joanna Baillie. Lived 1762–1851.

Anne Taylor (Mrs. Gilbert). Lived 1782–1866. Jane Taylor.
Lived 1783–1823. Photograph.

Mary Lamb. Lived 1765–1847. Photograph.

Mary Granville (Mrs. Delaney). Lived 1700–1788. From
painting at Hampton Court.

Mrs. Trimmer. Lived 1741–1810. Engraving.

Mrs. Barbauld. Lived 1743–1825. Engraving.

Mrs. Opie. Lived 1769–1853.

Miss Mitford. Lived 1786–1854. Woodcut.

Mrs. Hofland. Lived 1770–1844. Engraving.

Mrs. Grant of Laggan. Lived 1753–1838. Engraving.

Jane Welsh (Mrs. Carlyle). Died 1866. Photogravure.

In Poetry.

Elizabeth Barrett (Mrs. Browning). Lived 1809–1861. Photo-
graph after picture by Mrs. Bridell Fox.

Adelaide Anne Procter. Lived 1825–1864. Photograph.

Christina Rossetti.

Jean Ingelow. Woodcut.

Felicia Browne (Mrs. Hemans). Lived 1794–1884. Engraving
after miniature.

Letitia Elizabeth Landon ("L. E. L."). Lived 1802–1839.
Engraving after Maclise.

Mrs. Tighe. Lived 1773–1810. Engraving after Bonney by
Caroline Watson.

In Fiction.

Maria Edgworth. Lived 1767-1849. Engraving.

Jane Austen. Lived 1775-1817. Engraving.

Fanny Burney (Madame d'Arblay). Lived 1752-1840.

Jane Porter. Lived 1776-1856. Engraving.

Mrs. Gore. Lived 1799-1861. Engraving.

Mrs. Trollope. Lived 1790-1863. Woodcut.

Sidney Owenson, Lady Morgan. Lived 1788-1859. Photograph.

The Honourable Mrs. Norton. Lived 1807-1877. Engraving.

Elizabeth Hamilton. Died 1816. Engraving after Raeburn.

Charlotte Brontë. Lived 1816-1855. Photograph from picture by Richmond.

Mrs. Gaskell. Lived 1810-1865. Photograph from portrait by Richmond.

"George Eliot." Lived 1819-1880. Photograph.

Mrs. Oliphant. Photograph.

Anne Thackeray (Mrs. Richmond Ritchie). Photograph.

Charlotte Yonge. Photograph.

Dinah Muloch (Mrs. Craik). Died 1887. Photograph.

Jessie Fothergill. Died 1891. Photograph.

Mrs. Humphry Ward. Photograph.

Mrs. W. K. Clifford.

"Edna Lyall."

In Drama and Music.

Mrs. Siddons. Lived 1755-1831. Engraving after Sir Joshua Reynolds—as "Tragic Muse."

Fanny Kemble (Mrs. Butler). Died 1893. Engraving after Sir Thomas Lawrence.

Mrs. Kendall.

Ellen Terry. Photograph.

Rosalind Frances Ellicott. Photograph.

Clara Augusta Macirone. Photograph.

Mrs. Julian Marshall. Photograph.

Oliveria Prescott, A.R.A.M. Photograph.

Maude Valerie White. Photograph.

In Art.

Mary Moser, R.A. (Mrs. Lloyd). Died 1819.

Angelica Kaufmann, R.A. Lived 1740–1807. Engraving

Anne Linwood. Lived 1756–1845. Engraving.

Mrs. Conway. Engraving.

Mary Beale. Lived 1632–1697. Engraving.

H.R.H. Princess Louise. Engraving.

H.R.H. Princess Beatrice. Photograph.

Louisa, Marchioness of Waterford. Died 1891.

Mrs. Allingham.

Lady Butler.

Mrs. Julia Cameron.

Mrs. Louisa Stair Canziani.

Miss A. Grant.

Miss Mary Grant.

Mrs. Marrable.

Miss Moody.

Mrs. Perugini.

Mrs. Jopling Rowe.

Mrs. Adrian Stokes.

Mrs. Swynnerton.

India.

BY SAMUEL DIGBY,

Secretary to the Indian Section of the Society of Arts.

At the Great Exhibition of the Industry of All the Nations which was held in Hyde Park in 1851, and which, as is well known, originated in a suggestion made by the lamented Prince Consort, as President of the Society of Arts, the area devoted to the Honourable East India Company, then the rulers of our Asiatic possessions, was 24,000 feet. So much accommodation has not been afforded to India at any subsequent International Exhibition either here or abroad, but the amount, large as it seems, was, of course, far exceeded on the occasion of the memorable Colonial and Indian Exhibition, which seven years ago did so much to strengthen the ties uniting England with her distant dependencies and colonies. The East India Court at the '51 Exhibition contained what in those days was considered a very valuable and extensive collection, illustrating the natural resources and manufactures of the country, the Company receiving, as some acknowledgment of their exertions, an unclassified Council Medal. The cost of the East India Court, including the value of the exhibits purchased for the occasion, is stated in an official document to have been £160,000; but there is reason to believe that this sum is only a rough estimate, and the same may perhaps be said of the £60,000 put down for the French Palais de

l'Industrie (1855)—Napoleon the Third's "Temple of Concord"—where India occupied a comparatively small portion of space, between three and four thousand feet. At the London International Exhibition of 1862 the area of the Indian Court was 10,000 sq. ft., and the cost in Europe £2,694; at Paris in 1867 the respective figures were 8,700 sq. ft., and £4,562; at London in 1871, 8,000 sq. ft., and £2,734; at London in 1872, 8,000 sq. ft., and £2,136; at London in 1873, 8,000 sq. ft., and £1,279; at Vienna in the same year 10,000 sq. ft., and £12,342; at London in 1874, 8,000 sq. ft., and £1,202; at Philadelphia in 1876, 3,208 sq. ft.; and at Paris in 1878, 20,000 sq. ft., and £3,278. The part taken by the Indian authorities in the last-named exhibition was almost entirely confined to contributing a selection of raw products, food substances, and forest specimens, the higher art productions being sufficiently, and in some respects, splendidly represented by the presents that the Prince of Wales brought home from his Indian tour; contributions by several of Her Majesty's feudatories; exhibits of London and Paris importing firms; various private collections; and some metal work, pottery, chintz-printing, etc., specially selected in India at the request of a Committee, presided over by the Earl of Northbrook. On the whole, the display of Indian handicraft was neither so complete nor so systematic as at previous exhibitions, but in one respect it was unique. Sir George Birdwood, in his well-known and learned "Handbook to the Indian Court," pointed out that many of the objects in the Prince's collection were of a kind that are rarely or never seen out of India. At the excellent exhibition, held in 1880 in the enterprising and go-ahead capital of Victoria, the Indian Court, covering an area of upwards of 11,000 sq. ft., attracted much attention. Strenuous efforts were made to create a large market for Indian tea in Australasia. That the measures adopted at Melbourne were attended with some degree of success is shown by the fact that, whereas in 1878-80, the quantity of tea exported from India to the Antipodes was only about 80,000 lbs., it has now risen to upwards of 5,000,000 lbs. per annum. The trade is still expanding, but not with the rapidity that India desires. As Australia

consumes 30,000,000 lbs. of tea every year, it will be seen that, while China is losing her markets in England owing to the keen competition of India and Ceylon, she still retains her supremacy in Australasia. The hopes entertained that the Melbourne Exhibition would have the effect of providing as good an opening for Indian coffee as for Indian tea do not appear to have been realised, the quantity exported in 1890-91 being only 1,392 lbs. The Exhibition, however, was found to have given, for the time being at any rate, an impetus to the weaving of Tusser in Dhagulpore, and to the demand for the silk and mixed fabrics of Maldah. The imperfect steamship communications between the ports of India and Australasia have perhaps, more than anything else, hitherto prevented the two Continents from deriving the full benefit that was expected to accrue from the Melbourne Exhibition, and the one that grew out of it a little later in Calcutta. The next important exhibition in which India took share was that of Amsterdam. The total area allotted to India was a little over 12,000 sq. ft., and it may perhaps be assumed that a portion, at least, of the development we have lately seen of India's trade with the Continent of Europe is due to the Exhibition held in the Netherlands capital ten years ago. The grant made by the Government of India amounted to Rs. 12,000, and an additional sum to help to defray the expenses on this side was given by the Secretary of State in Council. Altogether, the expenditure in Europe was £2,255, and of this moderate amount £461 was recovered from private exhibitors. The original intention that the collection should be restricted to raw produce was to some extent departed from, partly on the initiative of the authorities in India themselves, and partly at the request of the Netherlands Minister in London. The further exhibits sent from India included not only a few groups of manufactured goods, such as mats, ropes, paper, pickles and preserves, and cigars, but some carpets, rugs, textile fabrics, carved work, etc. By also inviting the co-operation of the European importers of Indian goods the attractiveness of the Court was increased, and the expenses diminished. It is worthy of notice that the Executive Commissioner, Mr. J. R. Royle, carried out a plan, that was afterwards

enlarged upon with such *éclat* at the Colonial and Indian Exhibition, namely, the representation of a native bazaar. He obtained from India some life-size clay figures, and these models were set up in small shops. Of all the departments this seems to have been the most popular, next to the Tea-room, where, thanks to the combined liberality of the Calcutta Tea Syndicate and the Indian Government, native servants supplied cups of tea gratis to all comers. Mr. Royle writes : "The mere idea of any refreshment being given without charge appeared so strange to Dutch notions that visitors crowded to the Tea-room daily, and could scarcely believe that no charge would be made. Some of the better class of visitors at first objected to placing themselves under any obligation by drinking tea without payment ; but this feeling soon wore off, and the Tea-room was thronged during the hour and a half, to which it was found necessary to restrict the free distribution." That Indian tea, thus advantageously introduced to the notice of the Hollanders, made a favourable impression in Amsterdam, is shown by its having received no fewer than 58 awards, including 1 diploma of honour, 7 gold, 17 silver, and 14 bronze medals. One might almost say that the jurors paid in medals for the free cups. The returns show that the amount of Indian tea exported direct to Holland in 1890-91 was 13,972 lbs., that sent to other Continental States being as follows :—Germany, 29,449 lbs. ; France, 9,082 lbs. ; Austria, 7,423 lbs. ; Italy, 4,027 lbs. ; and European-Turkey, 1,225 lbs. The aggregate amount is probably not striking ; but we do not know how much of the 100,000,000 lbs., or more, that reach the United Kingdom annually, is transhipped to supplement the supplies sent direct from India to England's neighbours. Another means adopted to make the Amsterdam Exhibition of as much practical use as possible was the wise provision of a spacious sample-room. This was largely visited by merchants and brokers, who expressed the opinion that many of the Indian products would be readily saleable in Holland, both for local consumption and for transit to Germany when once known. At the Fisheries Exhibition, held in London in the same year, 3,150 sq. ft. of space was devoted to India, the expense in

Europe being about £1,200. This brief sketch of India's participation in foreign Exhibitions would not be complete without a passing allusion to the interesting International Forestry Exhibition that took place in Edinburgh in 1884. The Indian Court occupied 5,000 sq. ft., and was described by the Director of the local Museum of Science and Art as "the greatest feature of the Exhibition." Other experts were equally eulogistic, and the officer in charge, Colonel J. Michael, C.S.I., was fully justified in claiming, at the close of the Exhibition, that it had brought prominently into notice the fact that during the previous thirty-five years the Forest Department, of which he was the earliest practical pioneer, had made vast progress, and conferred great benefits upon India. The exposition made by our Eastern Empire at the Colonial and Indian Exhibition of 1886 far outstripped, as already mentioned, anything ever attempted by her in London or elsewhere. No fewer than 103,000 superficial feet were allotted to India, and these were apportioned to the different sections as follows :—Provincial Art Wares, 39,500 ; Imperial Economic Court, 19,500 ; Private Exhibitors, Tea and Tobacco, 12,550 ; Administration Courts, 8,850 ; Indian Vestibule, 2,600 ; Indian Palace, Courtyard and Shops, 8,030 ; Silk Court, 6,160 ; Tea-Houses, 5,810. In addition to this 2,818 feet were set apart for extra buildings in the adjoining pleasure-grounds. The funds available for providing collections from India consisted of Government of India grant, £10,000 ; Royal Commission grant, £3,000 ; Bombay Exhibition grant, £6,850 ; Royal Commission Screen grant, £2,500 ; making altogether £22,500. The above sums are exclusive of the special grants made by the local Governments from Provincial funds, and of the money expended by Her Majesty's feudatories, as well as by private individuals, in India. The unprecedented success of the Indian section was in no small measure attributable to the public-spirited and loyal munificence of the native princes. Indeed, one of the leading officials has placed on record his opinion that their support was the "making of the Exhibition," the value of which to the British Empire at large it is hardly possible to over-estimate. From the Colonial and Indian

Exhibition to the Paris Exhibition of 1889 is, so far as India is concerned, a great step. But the Exposition Universelle on the Champ de Mars marked a new departure. The Government of India made no grant whatever, and the cost of erecting a special building, on a plot of ground allotted by the French Administration, was mainly paid for by the sums charged to exhibitors for the twenty shops into which it was divided, and by a contribution from the Indian Tea Districts Association, in exchange for the privilege of selling tea in the Pavilion. The deficiency, about £350, was made up out of the general funds. The regulations permitted the sale of objects of genuine Oriental manufacture in the Indian Court. Since the Exhibition, attempts have been made to extend the sale of Indian tea in the French metropolis, and for that purpose a London company has gone to the expense of opening attractive shops in two or three of the most important quarters of the city, with, it is believed, satisfactory results.

A few particulars relating to Indian trade may not be out of place. The only imported articles on which a duty is now levied are : arms, ammunition, military stores, liquors, opium, petroleum, and salt. There is no export duty except for rice. With a population of, in round numbers, 280,000,000, scattered over 1,500,000 square miles, the imports last year amounted to Rx. 81,310,119, and the exports to Rx. 111,179,196. The imports are thus classified : merchandise, Rx. 66,587,457 ; gold, Rx. 4,118,929 ; silver, Rx. 10,603,733. The exports are divided as follows : Foreign merchandise re-exported, Rx. 4,485,179 ; Indian merchandise, Rx. 103,550,831 ; gold, Rx. 1,705,137 ; silver, Rx. 1,438,049. As Sir William Hunter remarked, in a paper recently read by him before the Indian Section of the Society of Arts : "In 1858 India was chiefly known as a dealer in drugs, dyes, and luxuries ; she is now one of the largest merchants in the world in food grains, fibres, and other great staples of universal consumption." All the more important of these commodities are on the free list, or are charged

with moderate duties in the McKinley Tariff. The following are the principal exports :—

- | | |
|----------------------------|-------------------------------|
| 1. Grains and pulse. | 10. Jute manufactures. |
| 2. Seeds. | 11. Coffee. |
| 3. Cotton, raw. | 12. Wool, raw. |
| 4. Opium. | 13. Provisions. |
| 5. Cotton yarns and cloth. | 14. Dyes (other than Indigo). |
| 6. Jute, raw. | 15. Lac. |
| 7. Tea. | 16. Wood and timber. |
| 8. Hides and skins. | 17. Oils. |
| 9. Indigo. | 18. Silk, raw. |
| 19. Sugar. | |

The prominent imports are :—

- | | |
|--|--|
| 1. Cotton goods and yarn. | 9. Chemicals, drugs, and medicine, dyes, &c. |
| 2. Metals, including hardware and cutlery. | 10. Railway material. |
| 3. Silk, raw and manufactured. | 11. Liquors. |
| 4. Oils, chiefly mineral. | 12. Apparel. |
| 5. Sugar. | 13. Coal. |
| 6. Machinery and millwork. | 14. Spices. |
| 7. Provisions. | 15. Glass and glassware. |
| 8. Woollen goods. | 16. Salt. |
| | 17. Paper and pasteboard. |
| 18. Umbrellas. | |

Last year the first two items comprised in value 50 per cent. of the entire imports. Formerly the United States sent large quantities of ice to India, but the trade has now been discontinued, the market being supplied by manufactories in Bombay and other towns. The most, in fact the only really, important article shipped to India from America at present is kerosene (the cargoes received in 1891-92 amounted to Rs. 1,084,148), and the demand for this is steadily declining, owing to Russian rivalry. In his last review of the Trade

of India, Mr. J. E. O'Connor writes: "If this competition should continue successfully for another few years, and the American oil be pushed out of the market, it is evident that the value of the imports from the United States will be reduced to an insignificant figure, for it represents 90 per cent. of the whole imports, and has done so for ten years past." The future may perhaps show that America has something else to give in return for the increased consumption of Indian tea that, it is hoped, will result from the World's Columbian Exposition.

INDIAN EXHIBITS.

The Exhibits in this Section, unless otherwise stated, are placed in the Manufactures Building (Ground Floor).

- 585 Ardeshir & Byramji**, 10 Hummum Street, Bombay, India; and 22, Oxford Street, London, W.

Indian silver and silver inlaid on metal ware; gold and silver jewellery; curtains and fabrics of silk and cotton; shawls and Indian carpets; embroidery; pottery; art metal work; carved sandalwood and ivory inlaid boxes, carved ivory figures; carved blackwood furniture; Indian fancy goods.

- 586 Banerjee, Dr. D. N.**, 43 Chorebagan, Calcutta, India.

Preparations from Indian indigenous herbs.

- 587 Bhumgara & Co., Framji P.**, Bombay and Madras, India; and 135 London Wall, London, E.C.

Indian metal vases and trays, brass and copper ware; gold and silver jewellery and plate; sandalwood, ivory and inlaid carved boxes; embroideries in silk, gold, and silver, curtains and tinsel cloths; furniture; fans and handscreens, and other fancy goods.

Bombay & Burmah Trading Corporation, Limited.

See GROUP XIX.

[Forest. B.]

- 588 Bourne & Shepherd**, Calcutta, Bombay, and Simla, India; care of Davidge & Long, 68 Basinghall Street, London, E.C. [Gallery.]

Photographic carbon enlargements: general view of Darjeeling; "The Snowy Range" from Sandakjoo; Mount Everest; Kinchinjunga; Bathing Scene on the Hooghly; Tay Mahal, Agra; Buddhist Temple of Gaija, Bengal; Kootub Minâr, Delhi; Marquis of Lansdowne; Lord Roberts; Maharajah of Cooch Behar; Maharajah of Nepaul.

Croft & Co.

[Agric. B.]

See GROUP XVII.

589 Das & Gopinath, Bhugwan, Koonj. Gali., Benares City, India.

Khimkhap and gown cloth of pure gold, silver, and silk; wrapper; scarves; handkerchiefs; turbans of silver and silk; saffas flower case; money bags; laces; fans; hats; sumeas; coats and chowgas for Indian princes, and other art embroidery and needlework; silver utensils of various varieties.

590 De Forest Lockwood, Ahmedabad, India; and 7 East Ten Street, New York.

Complete room in carved teak wood from designs by Mr. Lockwood de Forest.

De Monte and Jost.

[Trans. B.]

See GROUP LXXX.

591 Doyle & Co., Harry, 2 Swallow Lane, Calcutta, India. London Agent, Wm. Duff & Co., 113 Cannon Street, E.C.

Indian silver jewellery; musk.

Harry & Co.

[Agric. B.]

See GROUP XXIII.

592 Hodges, Edward, Naini Tal, India. Agent: R. C. Treatt, Dunster House, Mincing Lane, London, E.C.

Essential oil, pomade, extract of Indian cassie, jasmin, cuxcux root.

593 Houssein, M. D., Zillah Hooghly, Burdwa, Bengal, India; and Augusta, Georgia, U.S.A.

Shawls, handkerchiefs, dresses, and fancy goods.

Indian Government Revenue and Agricultural Department.

[Forest. B.]

See GROUP XIX.

594 Indian Tea Association, Calcutta, India.

[Special building in the Grounds.]

Tea, from the following districts and estates:—

ASSAM.—Assam Frontier Co., Attreekhat Co., Amgoorie Estate, Bargang Co., Bhootia Chang Estate, Bishnath Co., Boisali Habee Estate, Borelli Co., Borpukhrie Co., Chubwa Co., Dahingeapar Estate, Greenwood Co., Hoolmaree Co., Hathibarrie Estate, Kellyden Estate, Kettela Co., Land Mortgage Bank's Estate, Lepelkatta Estate, Luckimpore Co., Medla Estate, Meleng Estate, Moabund Co., Moran Co., Ohat Estate, Oakland's Estate, Scottish Assam Co., Shakomato Co., Solabari and Malijan Estate, Tambulbaree Estate, Tezpore and Gogra Co., Thengalbarrie Estate, Titadimaro Estate, Tingri Co.

CACHAR.—Alyne Estate, Bengal Co., Bircampore Estate, Borokai Co., Cachar Co., Cutlecherra Estate, Dooloogram Estate, Doodputlie Co., East India Co., Indian Co., Jetinga Valley Co., Kallincherra Estate, Larsingah Estate, Marjagram Estate, New Mutual Co., North Western Cachar Co., Pathecherra Estate, Pathemara Estate, Puttareah Co., Ruttonpore Estate, Second Mutual Co., Scottpore Co., Tarrapore Co., Western Cachar Co.

CHITTAGONG.—Banigram Estate, Puttia Estate.

DARJEELING.—Avongrove Estate, Balasun Co., Darjeeling Co., Doom Dooma Estate, Gielle Co., Gyabarree Co., Happy Valley Estate, Kyel Estate, Land Mortgage Bank's Estate, Lizziepore Estate, Long View Co., Mim Co., Oak's Estate, Pandam Estate, Punkabaree Co., Puttabong Estate, Sidrapong Estate, Singbuli, and Murmah Co., Springside Co., Soom Co., Teesta Valley Co., Ting Ling Co., Tukvar Co.

DOOARS.—Altadanga Co., Ellenbarrie Estate, Good Hope Co., Gurjung-Jhora Co., Hope Co., Jaldacca Estate, Jalpaigorie Co., Malnadi Estate, Nedeem Co., Matelli Co., Nagasuri Co., Nedcem Co., Northern Bengal Co.

KUMAON.—Kousaine Co.

SYLHET.—North Sylhet Co., South Sylhet Co.

TERAI.—Belgachi Co., Central Terai Co., Mohurgong Co., New Chumta Co., Second Falodhi Co., Selim Co.

595 **Jardinji, Jehangir**, *Elphinstone Circle, Fort, Bombay, India.*
Manufactures.

596 **Lall & Son, Ganeshi**, *Jouri Bazar, Agra, India.*
Gold and silver embroidery.

Lipton, Thomas J.
See GROUP VIII.

[Agric. B.]

597 **Marwanjee & Co., P.**, *Bombay, India.* London Agents: *Francis James & Co., 27 Leadenhall Street, E.C.*

Indian brass, Benares, enamelled and other art metal ware; gold and silver plate and jewellery; embroidery; shawls and rugs; pottery; carved sandalwood boxes and ivory figures.

Murree Brewery Co.
See GROUP XII.

[Agric. B.]

Nowrojee Framjee.
See GROUP XXIII.

[Agric. B.]

598 **Rau Proyag**, *Dumraon, Shahabad, Bengal, India.*

Mechanical dolls, representing various phases of Hindu inner life.

599 **Shaw & Co., Jhoomuck**, *Dinapore, India.*

Table cloths, table napkins, bed sheets, and Tussar silk fabrics.

600 **Shaw, Chadee Lall**, *Dinapore, India.*

Table cloths, table napkins, bed sheets; silk fabrics.

601 **Shaw, M. L.**, *Manager, Behar Table Linen Manufactory, Dinapore, India.*

Table cloths, table napkins, bed sheets; Tussar silk fabrics; Benares cloths.

Sylhet Tea Garden.

[Agric. B.]

See GROUP VIII.

602 Tellery & Co., S. J., *Delhi, Calcutta, Bombay, and Simla, India.*

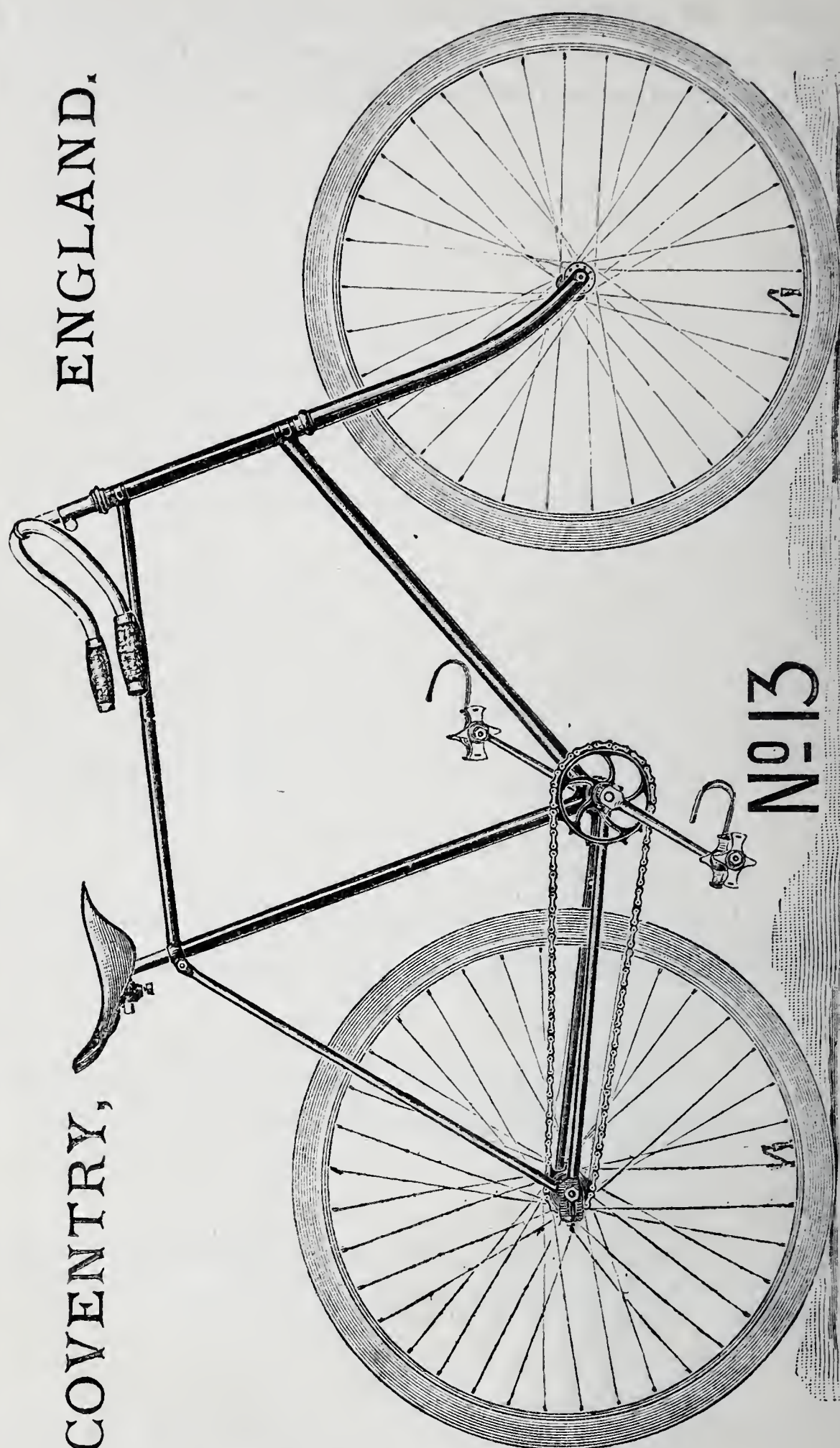
Indian art wares, fabrics and manufactures generally; Indian antiquities; specimens of economic products from the territories of the Maharajas of Godlipore, Mysore, and Patiala, and other parts of India.

CHICAGO, U.S.A.

J. I. WARMAN, Resident Managing Director.

WARMAN & HAZLEWOOD, Limited,

ENGLAND.



COVENTRY CROSS CYCLES.

Depot and Branch Offices:—

191, LAKE STREET, and FIFTH AVENUE.

ALPHABETICAL INDEX OF EXHIBITORS.

NOTE.—This does not include the contributors to Women's Work.

ABBREVIATIONS.

<i>Agric. B.</i>	= Agricultural Building.	<i>Mfct. B.</i>	= Manufactures Building.
<i>Art G.</i>	= Art Galleries.	<i>Mfct. G.</i>	= Manufactures Building Gallery.
<i>Elect. B.</i>	= Electrical Building.	<i>Mach. B.</i>	= Machinery Building.
<i>Ethn. B.</i>	= Ethnological Building.	<i>Mines B.</i>	= Mines and Mining Building.
<i>Fish. B.</i>	= Fisheries Building.	<i>Transp. B.</i>	= Transportation Building.
<i>Forest. B.</i>	= Forestry Building.	<i>TR. Ensol.</i>	= Transportation Building En- tiresol.
<i>Hort. B.</i>	= Horticultural Building.	<i>TR. Ann.</i>	= Transportation Building Annex.
<i>L. St. P.</i>	= Live Stock Pavilion.		

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272	Adamson Gun Syndicate, Limited, The, 36 Coleman Street, London, E.C. .	86	Transp. B..	193
	Aitchison, Prof. George, 150 Harley Street, London, W.	152	Art G. .	342
113	Albion Clay Co., Limited, Albion Works, Woodville, Burton-on-Trent	46	Mach. B. .	133
122	Albion Portland Cement Co., Limited, Greenhithe, Kent	47	Mines B. .	134
196	Aldridge, J. G. W., Westminster Chambers, 9 Victoria Street, London, S.W.	80	TR. Ann. .	181
277	Alexander and Co., Limited, James, Lambeth Soap Works, London, S.E. .	87	Mfct. B. .	215
525A	Alfieri, B., Chichele Road, Cricklewood, Middlesex	151	Mfct. G. .	377
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	Bates, Harry, 10 <i>Hall Road, St. John's Wood, London, N.W.</i>	139	Art G.	269
	Bayliss, Wyke, 7 <i>North Road, Clapham Park, London, S.W.</i>	140 141	Art G. ,,	275 311
77	Beach and Sons, Limited, T. W., <i>Ealing Road, Brentford, London, W.</i>	21	Agric. B.	37
	Beadle, J. P., 17B <i>Eldon Road, Victoria Road, Kensington, London, W.</i>	140	Art G.	275
	Beavis, Richard, 16 <i>Notting Hill Square, London, W.</i>	140	Art G.	275
527	Beck, R. and J., 68 <i>Cornhill, London, E.C.</i>	151	Mfct. G.	385
	Becker, H., <i>The Minories, All Saints', Col- chester, Essex</i>	141	Art G.	311
112	Beckmann and Co., 4 <i>Finsbury Street, London, E.C.</i>	45	Mines B.	132
381	Behrens, and Sons, Sir Jacob, 36 <i>Princess Street, Manchester</i>	102	Mfct. B.	231
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437	Benton and Johnson, 63 <i>King's Cross</i> <i>Road, London, W.C.</i>	106	<i>Mfct. B.</i> . .	238
308	Berger and Sons, Limited, <i>Lewis,</i> <i>Homerton, London, N.E.</i>	88	<i>Mfct. B.</i> . .	219
579	Besson and Co., F., 198 <i>Euston Road,</i> <i>London, N.W.</i>	158	<i>Mfct. B.</i> . .	394
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280	Bigg, Thomas, <i>Great Dover Street,</i> <i>Borough, London, S.E.</i>	87	<i>Mfct. B.</i> . .	215
497	Biggs, F. J., <i>Leadenhall Buildings,</i> <i>London, E.C.</i>	150	<i>Mfct. G.</i> . .	374
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528	Billington and Co., H., <i>Augathella,</i> <i>Queensland, Australia</i>	151	<i>Mfct. G.</i> . .	385
55	Bingham - Cox and Co., <i>Kingsbury</i> <i>Brewery, St. Albans, Hertfordshire</i>	12	<i>Agric. B.</i> . .	24
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281	Bishop and Sons, Limited, <i>Alfred,</i> 49 <i>Spelman Street, Mile End, New Town,</i> <i>London, E.</i>	87	<i>Mfct. B.</i> . .	215
580	Bishop & Sons, E., <i>Belmont Street, Chalk</i> <i>Farm Road, London, N.W.</i>	158	<i>Mfct. G.</i> . .	394
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309	Bond, John (now J. Hickisson), 75 South- gate Road, London, N.	88	Mfct. B. .	219
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19	British Deli and Langkat Tobacco Co., Limited, 13 George Street, Mansion House, London, E.C.	8	Agric. B.	20
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20	British North Borneo Co., 15 Leadenhall Street, London, E.C.	8	Agric. B.	20
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502	Decorative Art Journals Co., Limited, <i>76a Mosley Street, Manchester</i>	150	Mfct. G. .	375
590	De Forest, Lockwood, <i>Ahmedabad, India</i>		Indian Exhibits.	472
199	De Monte and Jost, <i>Bangalore and Sirdar Mansions, Bombay, India</i>	80	Transp. B. .	181
140	Denny and Co., <i>Engineers, Dumbarton, Scotland</i>	69	Transp. B. .	147
250	Denny and Bros., William, <i>Leven Ship Yard, Dumbarton, Scotland</i>	85	Transp. B. .	189
32	Denton, Smith, <i>Manchester Road, Bradford</i>	10	Agric. B. .	22
	Detmold, H. E., <i>Sunny Bank, Ore, Hast- ings, Sussex</i>	140	Art G. .	281
41	Dewar and Sons, John, 48 <i>Lime Street, London, E.C.</i>	11	Agric. B. .	28

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	Dillon, Frank, 13 Upper Phillimore Gardens, Kensington, London, W.	141	Art G. .	313
217	Disc Wheel Co., Limited, 60 Defoe Road, Tooting, Surrey	83	Transp. B. .	184
525A	Diston, A., Leven, Fifeshire, Scotland	151	Mfct. G. .	377
	Dobson, W. C. T., Gentilshurst, Lods- worth, Petworth, Sussex	140 141	Art G. . ,, .	281 313
357	Doig and Co., Wm., 175 New Bond Street, London, W.	93	Mfct. B. .	225
534	Dore, James, 27 High Street, Sandown, Isle of Wight	151	Mfct. G. .	386
404	Dormeuil Frères, 10 New Burlington Street, London, W.	103	Mfct. B. .	234
200	Dorn, Charles Frederick, 19 Blythe Hill, Catford, London, S.E.	80	Transp. B. .	181
184	{Doulton and Co., Lambeth Pottery, London,}	77	Mfct. B. .	154
347	{ S.E. }	91	Mfct. B. .	223
535	Downer, Fredk., Blake House, Watford, Hertfordshire	151	Mfct. G. .	386
591	Doyle and Co., Harry, c/o William Duff and Co., 113 Cannon Street, London, E.C. Indian Exhibits .			472
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	Dressler, Conrad, Cedar House, Glebe Place, Chelsea, London, S.W.	139	Art G. .	269
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71	Drogheda Chemical Manure Company, Drogheda, Ireland	17	Agric. B. .	27
	Drury, Alfred, 6 Gunter Grove, Chelsea, London	139	Art G. .	269
312	Duckett and Co., Ink Makers, Heeley, Sheffield	88	Mfct. B. .	219

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	Earle, Charles, 9 <i>Duke Street, Portland</i> <i>Place, London, N.W.</i>	141	Art G.	313
	East, Alfred, 4 <i>Grove End, St. John's</i> <i>Wood, London, N.W.</i>	140 141	Art G. ,,	281 313
565	Ebner, Joseph Francis, 150 <i>Old Street</i> , <i>St. Luke's, London, E.C.</i>	152	Mfct. G.	390
141	Economic Smokeless Fire Co., 28 <i>Market Street, Bradford</i>	69	Mach. B.	147
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83	Edmunds, Joseph, <i>Belper Street, Barns-</i> <i>bury, London, N.</i>	23	Agric. B.	38
455	Eley Brothers, Limited, 254 <i>Gray's Inn</i> <i>Road, London, W.C.</i>	113	Mfct. B.	242
	Elgood, George S., 8 <i>The Crescent, Leices-</i> <i>ter</i>	141	Art G.	314
331	Elliott, James, 54 <i>Brook Street, London, W.</i>	90	Mfct. B.	222
	Ellis, Edwin, 76 <i>Newman Street, London</i> , <i>W.</i>	140	Art G.	281
	Ellis, Tristram, 8 <i>Trevor Terrace, Rutland</i> <i>Gate, London, S.W.</i>	141 143	Art G. ,,	314 329
288	Ellison, Jun., Henry, <i>Whitechapel Road</i> , <i>Cleckheaton, Yorkshire</i>	87	Mfct. B.	216
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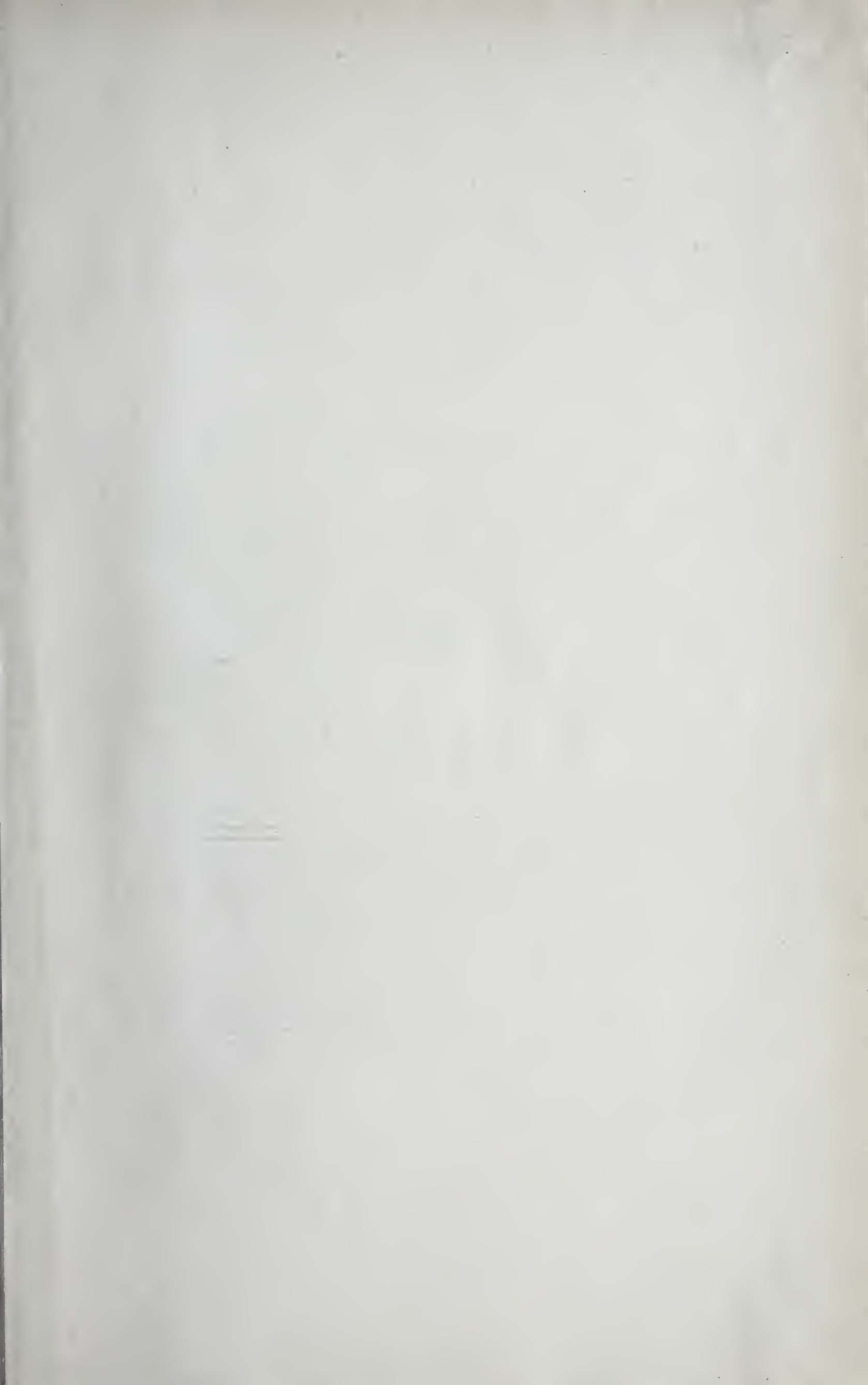
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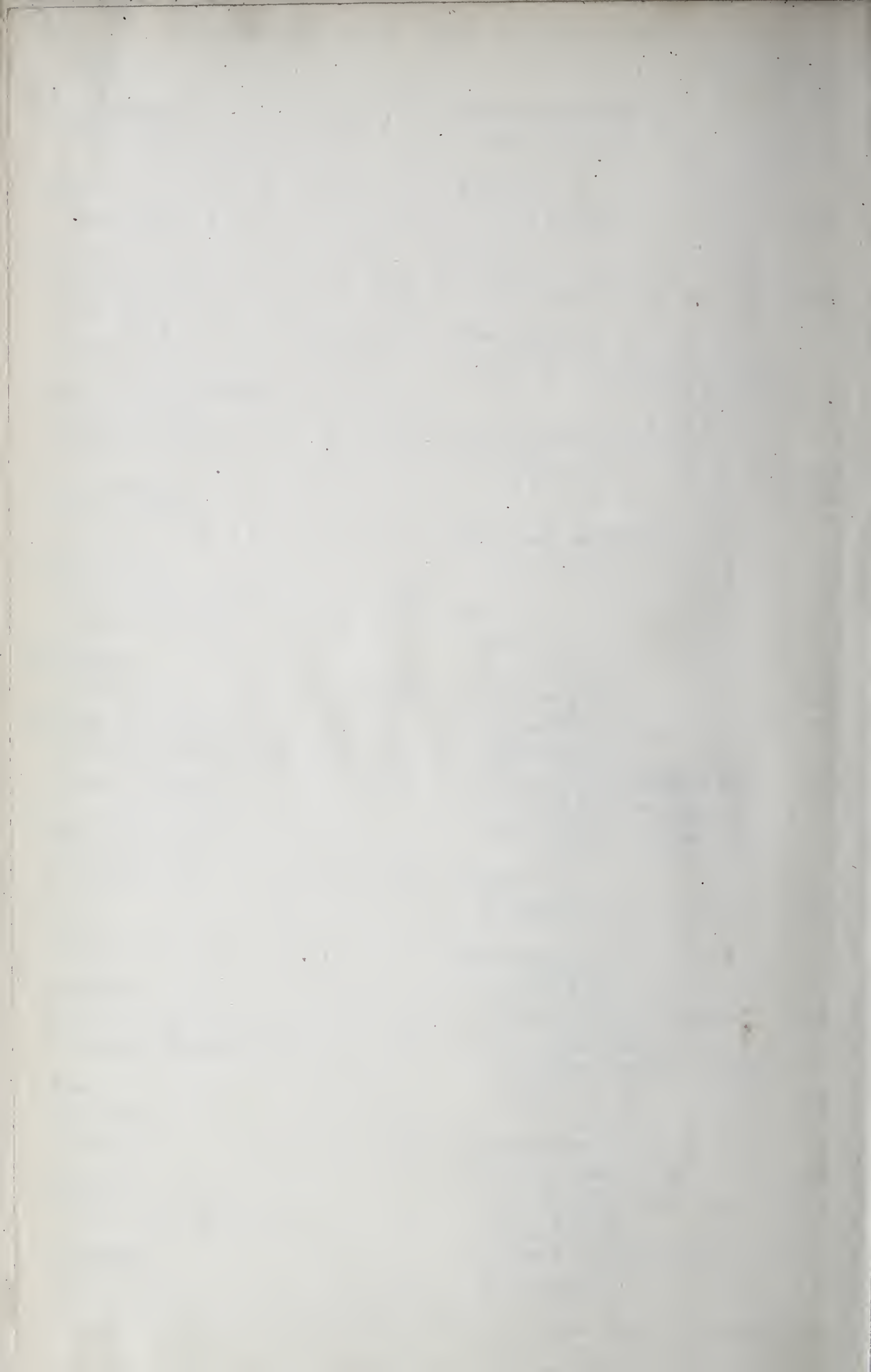
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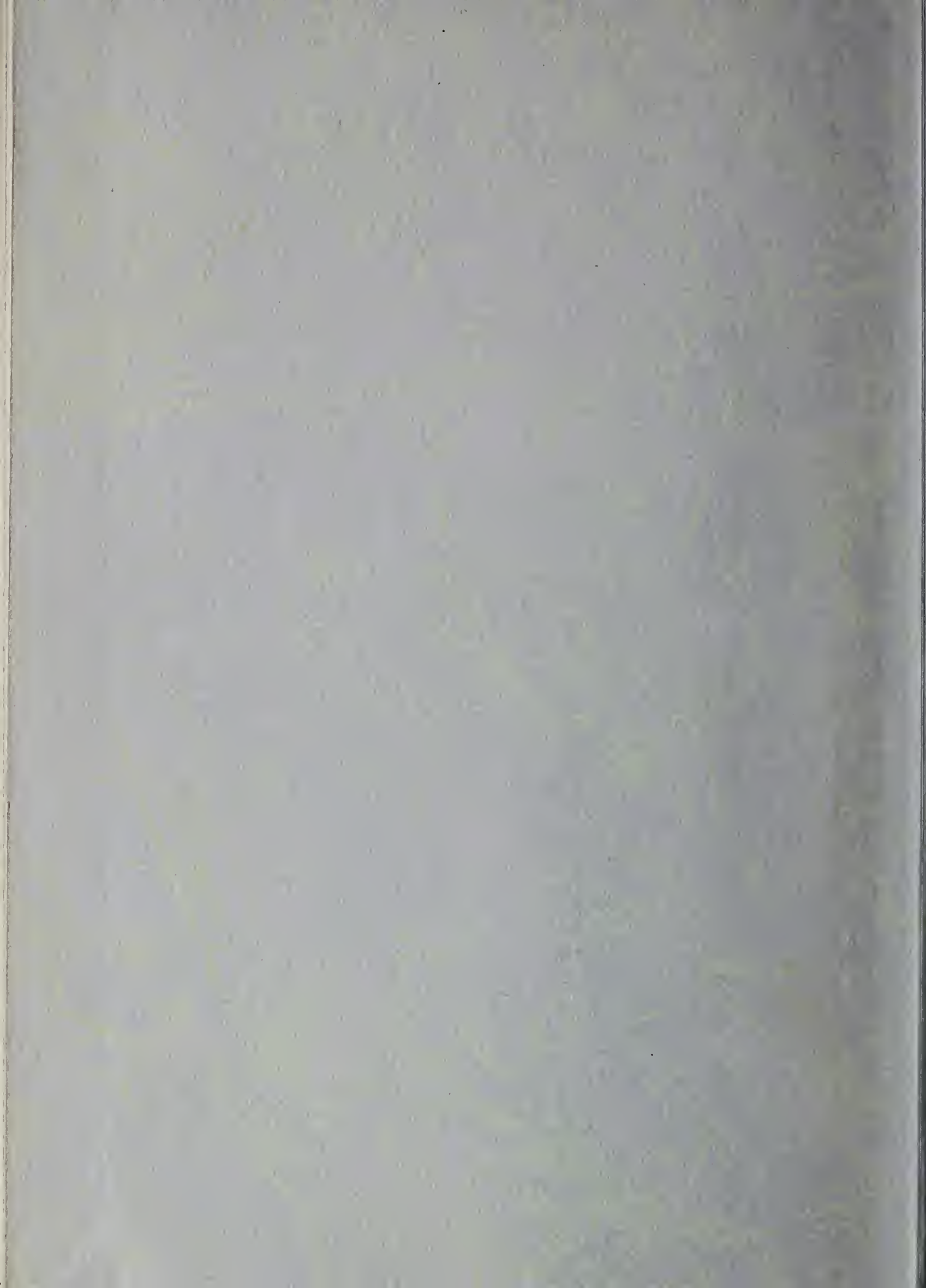
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